1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

DOCUMENT RESUME

ED 224 690 SE 039 720

AUTHOR Bowman, Harry L.; And Others
TITLE Numerical Skills Curriculum Guide. Focus on the Trained Person. Supplement to Technical Report 135.
INSTITUTION Naval Training Analysis and Evaluation Group, Orlando, Fla.
PUB DATE Nov 82
NOTE 237p.; For related document, see ED 223 450.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC10 Plus Postage.
DESCRIPTORS Adult Education; *Basic Skills; Curriculum Design; Curriculum Guides; Field Tests; Guidelines; Instructional Materials; Learning Modules; Mathematics Curriculum; *Mathematics Education; *Mathematics Instruction; Postsecondary Education; *Program Descriptions; *Remedial Mathematics; Teaching Methods
IDENTIFIERS *Naval Training; Navy

ABSTRACT

This document presents a basic numerical skills curriculum for use in either Academic Remedial Training or Apprentice Training in the Navy. The curriculum is designed to enable students who are deficient in numerical skills to attain at least minimal proficiency in elementary mathematics. The Training Analysis and Evaluation Group (TAEG) field-tested the curriculum with recruits awaiting entrance into the Fireman Apprentice Training course in Orlando, Florida. Results were seen as positive, with student performance measures indicating that a group with an initial mean mathematical grade level of 6.9 raised their proficiency to above grade 8 level after an average of eight days of instruction. This indicated that the curriculum successfully taught basic mathematical skills. This guide presents a complete description of skills taught, instructor activities, supplemental reading materials, and criterion tests. (The curriculum is referred to as the Mathematical Skills Curriculum, but this name has been changed to Numerical Skills Curriculum). (MP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED224690

TAEG

TRAINING ANALYSIS AND EVALUATION GROUP

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

√ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

SUPPLEMENT TO TECHNICAL REPORT 135

SE

NUMERICAL SKILLS CURRICULUM GUIDE

NOVEMBER 1982

FOCUS ON THE TRAINED PERSON

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

TAEG

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

SE039 720

TRAINING ANALYSIS AND EVALUATION GROUP
ORLANDO, FLORIDA 32813

2

Supplement to Technical Report 135

NUMERICAL SKILLS CURRICULUM GUIDE

Harry L. Bowman
Paul L. Jones
Robert A. Kaiser

Memphis State University

Cheryl J. Hamel, Editor
Training Analysis and Evaluation Group

Field Tested By
IM3 E. Marshall
YM3 T. L. Harrington

Academic Remedial Training Division
Recruit Training Command
Orlando, Florida

ACKNOWLEDGMENTS

The Numerical Skills Curriculum was written in fulfillment of contract number N00612-79-R-0477 between the Chief of Naval Technical Training (CNTECHTRA) and Memphis State University.

Appreciation is expressed to the following personnel for their assistance in the development of the curriculum.

- Dr. John Petry, Research Associate, Bureau of Education Research and Services, Memphis State University, who served as technical editor
- Linda Graham, formerly of CNTECHTRA, Code 016, who provided helpful suggestions
- Dr. Norman J. Kerr, CNTECHTRA, Code 016, who served as contract monitor of the project
- Dr. Peter Kincaid, Training Analysis and Evaluation Group, who served as field test coordinator
- Janet Thompson, Training Analysis and Evaluation Group, who served as curriculum consultant during the field test
- CDR William Losa, Chief of Naval Education and Training, Code N-55, who provided ideas and suggestions throughout the development and field test of the curriculum.

This curriculum guide is a supplement to Technical Report 135 which contains a description of the field test of the curriculum.*

*C. J. Hamel, J. P. Kincaid, and J. Thompson. Field Test of a Numerical Basic Skills Curriculum. Technical Report 135, November 1982. Training Analysis and Evaluation Group, Orlando, FL 32813.

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Supplement to Technical Report 135
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:
4. TITLE (and Subtitle): NUMERICAL SKILLS CURRICULUM GUIDE
5. TYPE OF REPORT & PERIOD COVERED: Final
6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): Harry L. Bowman, Paul L. Jones and Robert A. Kaiser
8. CONTRACT OR GRANT NUMBER(s): N00612-79-R-0477
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Memphis State University, Memphis, TN 38152
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: Chief of Naval Technical Training (016), Naval Air Station Memphis, Millington, TN 38054
12. REPORT DATE: November 1982
13. NUMBER OF PAGES: 170
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): Training Analysis and Evaluation Group, Department of the Navy, Orlando, FL 32813
15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release, distribution is unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

A description of the field test of this curriculum is contained in TAEG Technical Report 135.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Numerical Skills
Basic Skills
Mathematical Skills
Academic Remedial Training
Deficiencies
Apprentice Training
Fundamental Skills
Remedial Training
Proficiency

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents a numerical basic skills curriculum for use in Academic Remedial Training or in Apprentice Training. The curriculum is designed to enable students who are deficient in basic numerical skills to attain at least minimal proficienty in elementary mathematics.

The project was undertaken by the Training Analysis and Evaluation Group
(continued on reverse)

20. ABSTRACT (continued)

as one of several initiatives in response to tasking by the Chief of Naval Education and Training in the area of basic skills training.

The results of a field test of the curriculum with recruits awaiting entrance into the Fireman Apprentice Training course in Orlando were positive.

FOREWORD

The Numerical Skills curriculum is a contribution to the Navy's increasing effort to provide basic skills training. The curriculum, designed for use in either Academic Remedial Training or Apprentice Training, enables the student to attain a "minimum proficiency" in elementary mathematics.

The Training Analysis and Evaluation Group (TAEG) was tasked by the Chief of Naval Education and Training to field test the curriculum. Results of a field test with recruits awaiting entry into the Fireman Apprentice Training course showed that the curriculum successfully teaches basic mathematical skills. Student performance measures indicated that a group with an initial mean mathematical grade level of 6.9 raised their proficiency to above eighth grade after an average of eight days in the curriculum.

This curriculum guide presents a complete description of the skills taught by the curriculum, instructor activities, supplemental reading materials, and criterion tests. Throughout the guide, the curriculum is referred to as the Mathematical Skills Curriculum; however, that name has been changed to Numerical Skills Curriculum.

TABLE OF CONTENTS

Section		Page
I	INTRODUCTION	1
	Operational Overview of Mathematical Skills Curriculum	1
	Curricular Objectives	5
II	SCREENING, DIAGNOSTIC, AND EVALUATIVE INSTRUMENTS	13
	Rationale for Instrumentation	13
	Screening	14
	The Stanford Diagnostic Mathematics Test	15
	Criterion Tests	17
	Minimum Performance Levels on the Instruments	18
III	CURRICULUM AND INSTRUCTION	21
	Scope and Sequence of the Curriculum	23
	Instructional Materials	25
	Organization of the Instructional Program	26
IV	INSTRUCTIONAL PROCEDURES	29
	Instructional Strategies	29
	Instructional Steps	32
V	INDIVIDUALIZED INSTRUCTIONAL MANAGEMENT SYSTEM	39
	Skill Prescriptions	39
	Instructional Management Record	40
	Skill Folder	40
	Facilitating Student Progress	40
LISTING OF RESOURCES-MATHEMATICAL SKILLS CURRICULUM		44
SKILL PRESCRIPTIONS		45
APPENDIX A:	WORKSHEETS FOR PROBLEM SOLVING-MISSING DATA	110
APPENDIX B:	CRITERION TESTS	116
APPENDIX C:	CRITERION TEST ANSWER KEYS	150

SECTION I

INTRODUCTION

The need for adequate academic skills by today's sailors is becoming increasingly important because job classifications are more complex and more technologically oriented. Training programs for Navy job classifications require that the sailor have a thorough knowledge of the basic academic skills --mathematics being one of these skills. Failure to demonstrate an adequate knowledge of the basic skills may result in the sailor being unable to function in his job classification and, therefore, being unsuccessful in the Navy. On the other hand, mastery of the basic skills will enable the sailor to experience success in Navy life and career advancement.

The Mathematical Skills Curriculum[1] is designed to remediate deficiencies as measured and identified by diagnostic test results in mathematics. The remediation activities will enable the student to show at least minimal proficiency in mathematics.

Operational Overview of Mathematical Skills Curriculum

It is necessary to understand the process through which remediation occurs in order for the instructor to be successful in guiding skill development. The design for implementation of the curriculum is shown in Figure 1-1. The major phases of this design are: administering the Stanford Diagnostic Mathematics Test (SDMT), preparing the Instructional Management Record for mathematics, selecting the skill prescriptions, assigning the prescriptive activities, holding a conference with the student who will receive instruction, preparing for and conducting instruction, and administering the criterion tests.

[1]Throughout this guide, the curriculum is referred to as the Mathematical Skills Curriculum; however, that name has been changed to Numerical Skills Curriculum.

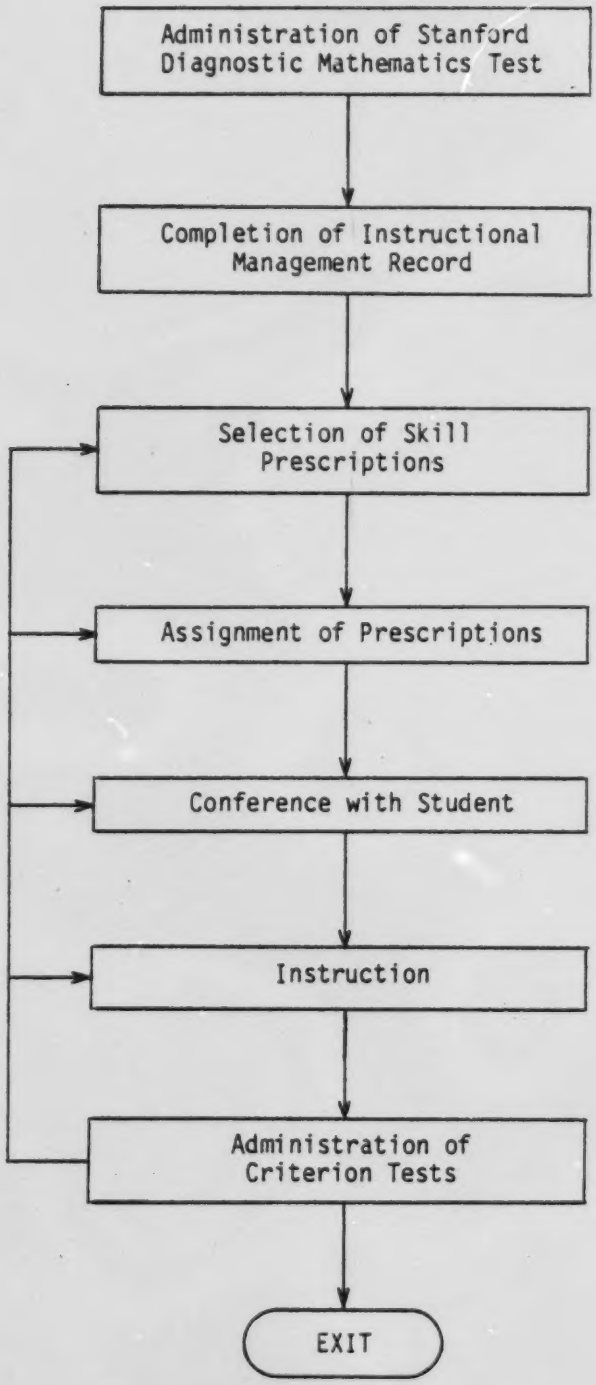


Figure 1-1. Design for Curricular Implementation

A brief description of each operation is provided to increase understanding of the process of remediation. It is imperative that all instructors become thoroughly familiar with this process in order to implement the curriculum effectively and guide the students in skill development.

Administering the SDMT

The administration of the SDMT is the first step in the remediation process. The instrument is administered to all students who are assigned to the Mathematical Skills Curriculum. The purpose in administering the SDMT is to identify the specific deficiencies that should be addressed by the remedial activities. An individual student will be assigned only those remedial activities that relate to his weaknesses as diagnosed by the SDMT.

Instructional Management Record

The Instructional Management Record is a tool that serves as a management device for recording and tracking an individual's progress through the remediation process. It must be maintained on a current basis because it tells the instructor where the individual student should be working at any given moment. It also shows the student how much progress that he has made since entering the program.

Selection of Skill Prescriptions and Activities

The skill prescriptions are the central part of the remediation process. Each skill prescription is coded to an objective of the curriculum and treats a particular skill deficiency. The instructor selects the skills prescriptions that are applicable for treating the deficiencies identified for each student through the diagnostic test.

Each skill prescription contains several activities that can be assigned for remediation. By using one skill prescription at a time and wisely

selecting the activities to be performed, the instructor will be able to structure an individualized program for each student. It is important that the instructor become knowledgeable of each skill prescription and its activities in order that he may make the best possible selection for the student who needs remediation.

Conference

The conference is designed for the purposes of acquainting the individual student with how to proceed in the remediation process, to help the individual overcome any anxieties that may develop because of the deficiencies identified with the SDMT, and to create a feeling of confidence between the instructor and the student. Positive motivation is the key to establishing good relationships between the student and the instructor. It is the responsibility of the instructor to set the climate for learning. Thus, the conference is an excellent vehicle for establishing an effective teaching-learning climate.

Instruction

Instruction for the mathematics curriculum involves both group and individual work. The instructional groups will be formed on the basis of common need. For example, if five individuals need to work on multiplication of fractions, then the instructor should teach this concept to all of them in a group. Individual work will be based on the deficiencies identified by the SDMT.

Instruction requires that several tasks be performed. These tasks include instructional planning, group instruction, individual instruction, record keeping, monitoring progress and providing motivation, reassigning students, and administering criterion evaluations. It should be emphasized that the instructor is the key to good instruction.

Criterion Evaluation

The criterion tests are used to assess the proficiency of the student. Whenever the student has completed each of the assigned prescriptions, he is ready for the criterion test. The results of the criterion test may provide a basis for (1) concluding that the deficiency has been remediated, (2) continuing in the prescription if mastery has not been achieved, or (3) exiting the mathematics curriculum if all modules have been completed.

Curricular Objectives

The objectives of the Mathematical Skills Curriculum have been formulated at three levels: general, terminal, and enabling. At the highest level, the general objective is a statement of performance related directly to a broad skill area. For example, number system and numeration is a broad skill area whose general objective covers whole numbers/decimal place value, rational numbers/numeration, and operations properties.

The terminal objectives represent more specific statements of performance than the general objectives. Each terminal objective includes the specification of the behavior to be demonstrated, the conditions under which the performance is to occur, and the mastery criterion. Terminal objectives are subsumed by higher order general objectives. For example, the terminal objectives for the computation area focus on whole numbers, fractions, decimals, and number sentences, respectively. The modules of the curriculum are defined at the terminal objective level. The assessment of exit performance using the criterion tests is conducted at this level as well.

The enabling objectives focus on skills at the lowest level of specificity. Each enabling objective contains the specification of the behavior to be demonstrated and the conditions under which the performance is to occur. One

or more enabling objectives would be encompassed by each terminal objective. For example, enabling objectives on decimals include addition and subtraction skills and multiplication skills. The skill prescriptions are designed to address deficiencies which are identified at the enabling objective level.

A three-digit numerical code system is used to designate the various levels. General objectives are numbered from 1.00 through 3.00. The inclusion of one digit greater than 0 in the first place to the right of the decimal identifies an objective as a terminal objective. Enabling objectives are designated by two digits greater than 0 to the right of the decimal.

The curricular objectives are presented below for the general, terminal, and enabling levels.

NUMBER SYSTEM AND NUMERATION

GENERAL OBJECTIVE

1.00 The student will demonstrate an understanding of the whole number system, decimal place value, fractions, decimals, and numerical operations and properties.

TERMINAL OBJECTIVES

1.10 Given instructional activities on whole numbers and decimal place value, the student will be able to count, to read and interpret numbers, to compare and order numbers, and to approximate numbers with an accuracy of at least 80 percent.

1.20 Given instructional activities on common fractions and decimals, the student will be able to name parts of a whole in terms of fractions and interpret fractions and decimals with an accuracy of 80 percent.

1.30 Given instructional activities on numerical operations and properties, the student will demonstrate an understanding of the fundamental operations and their properties with an accuracy of 80 percent.

ENABLING OBJECTIVES

1.11 Given an instructional format using number series and number lines, the student will be able to complete counting patterns with an accuracy of at least 80 percent.

1.12 Given a series of four-digit to eight-digit numbers including numbers with zero digits, the student will be able to read the numbers with an accuracy of at least 80 percent.

1.13 Given a series of numerals in expanded form and standard form, the student will be able to interpret these numerals in opposite forms and determine the value of digits in numerals with an accuracy of at least 80 percent.

1.14 Given a series of numerical problems, the student will be able to name the missing digit in the solutions to the problems with an accuracy of 80 percent.

1.15 Given a number series, the student will be able to identify the missing number in a series, order the numbers by identifying the largest number in a series, and naming the number of odd or even numbers in a series with an accuracy of 80 percent.

1.16 Given sets of numbers, the student will be able to round the numbers to an approximation and estimate products with an accuracy of at least 80 percent.

1.21 Given a series of fractions, the student will be able to name a designated part of a unit as a common fraction, rename fractions, and determine the largest or smallest fraction with an accuracy of at least 80 percent.

1.22 Given a series of decimals, the student will be able to identify the largest and smallest decimals and rename decimals as common fractions with an accuracy of at least 80 percent.

1.31 Given a series of fundamental operations, the student will demonstrate an understanding of the operations by identifying number factors and applying the distribution and inverse properties with an accuracy of at least 80 percent.

COMPUTATION

GENERAL OBJECTIVE

2.00 The student will demonstrate an understanding of basic numerical operations of addition, subtraction, multiplication and division involving whole numbers, fractions, decimals, and number sentences.

TERMINAL OBJECTIVES

2.10 Given instructional activities on addition of whole numbers with renaming, the student will be able to add numbers through the thousands with an accuracy of 80 percent.

2.20 Given instructional activities on subtraction of whole numbers with renaming, the student will be able to subtract whole numbers through the thousands with an accuracy of 80 percent.

2.30 Given instructional activities on multiplication of whole numbers involving renaming and partial products, the student will be able to multiply whole numbers through the hundreds with an accuracy of 80 percent.

2.40 Given instructional activities on division of whole numbers excluding and including internal remainders, the student will be able to divide three-digit numbers by two-digit numbers with an accuracy of 80 percent.

2.50 Given instructional activities on the addition and subtraction of common fractions, the student will be able to find the sums and differences with an accuracy of 80 percent.

2.60 Given instructional activities on the addition, subtraction, and multiplication of decimals, the student will be able to add, subtract, and multiply decimals through the hundredth with an accuracy of at least 80 percent.

2.70 Given instructional activities on number sentences, the student will be able to solve simple and parenthetical number sentences with an accuracy of at least 80 percent.

ENABLING OBJECTIVES

2.11 Given addition problems, the student will be able to find the sums of the numbers with an accuracy of at least 80 percent.

2.21 Given subtraction problems, the student will be able to find the differences with an accuracy of at least 80 percent.

2.31 Given multiplication problems, the student will be able to name the product of two factors with an accuracy of at least 80 percent.

2.32 Given a series of multiplication problems with renaming and without partial products, the student will be able to find the product of a factor in the tens or hundreds and a factor between 2 and 9 with an accuracy of at least 80 percent.

2.33 Given multiplication problems with partial products, the student will be able to find the product of two factors, one not exceeding 25, with an accuracy of at least 80 percent.

2.41 Given division problems, the student will be able to name the quotients when the divisors are less than 10 and the dividends are greater than 25 with an accuracy of at least 80 percent.

2.42 Given division problems with one-digit divisors and no internal remainders, the student will be able to divide whole numbers by 2, 3, or 4 with an accuracy of at least 80 percent.

2.43 Given division problems with internal remainders, the student will be able to divide whole numbers by 2, 3, or 4 with an accuracy of at least 80 percent.

2.44 Given division problems with divisors in the tens, the students will be able to find the quotients with an accuracy of at least 80 percent.

2.51 Given common fractions with like denominators, the student will be able to find the sums and differences of these fractions with an accuracy of at least 80 percent.

2.61 Given problems to add and subtract decimals, the student will be able to find the sums and differences of decimals with an accuracy of at least 80 percent.

2.62 Given problems to multiply whole numbers and decimals, the student will be able to find the products expressed in tens and hundreds with an accuracy of at least 80 percent.

2.71 Given simple multiplication and division number sentences, the student will be able to find missing factors with an accuracy of at least 80 percent.

2.72 Given number sentences involving parentheses, the student will be able to solve the sentences and find the correct factors with an accuracy of at least 80 percent.

APPLICATIONS

GENERAL OBJECTIVES

3.00 The student will demonstrate the ability to solve mathematical word problems, to use tables and graphs for problem solving, and to apply knowledge of geometry and measurement.

TERMINAL OBJECTIVES

3.10 Given instructional activities on solving mathematical problems presented in word form, the student will be able to solve two-step problems and ratio problems with an accuracy of at least 80 percent.

3.20 Given instructional activities involving the use of tables and graphs, the student will be able to read and interpret data from tables and graphs with an accuracy of at least 80 percent.

3.30 Given instructional activities involving simple geometric figures and measurement units, the student will be able to recognize geometric figures and their properties and to understand time, English, and metric units of measurement with an accuracy of at least 80 percent.

ENABLING OBJECTIVES

3.11 Given word problems involving one step or two steps, the student will be able to identify the appropriate number sentence to solve the problems with an accuracy of at least 80 percent.

3.12 Given two-step word problems, the student will be able to solve the problems with an accuracy of at least 80 percent.

3.13 Given word problems involving ratios, the student will be able to solve rate problems involving time, time and distance, and money with an accuracy of at least 80 percent.

3.14 Given word problems with missing data, the student will be able to identify the additional information needed to solve the problems with an accuracy of at least 80 percent.

3.21 Given tables containing rows and columns of data, the student will be able to read and use the data in the tables with an accuracy of at least 80 percent.

3.22 Given graphs using columns and bars, the student will be able to read and use the data in the graphs with an accuracy of at least 80 percent.

3.31 Given geometric figures, the student will be able to identify specified figures and to recognize geometric properties with an accuracy of at least 80 percent.

3.32 Given problems involving units of time, the student will be able to solve problems involving hours, days, and weeks with an accuracy of at least 80 percent.

3.33 Given problems involving English units of measurement, the student will be able to estimate units and convert from one unit of measurement to another with an accuracy of at least 80 percent.

3.34 Given problems involving metric units of measurement, the student will be able to name the appropriate metric units used in different situations and relate the meter to other linear metric units with an accuracy of at least 80 percent.

SECTION II

SCREENING, DIAGNOSTIC, AND EVALUATIVE INSTRUMENTS

Mathematical skill development requires a systematic process for identifying students who need additional mathematical skills, diagnosing the specific skill deficiencies to be addressed through instruction, and determining when these skills have been acquired. Two options for screening students into the curriculum are the Metropolitan Achievement Tests: Mathematics Survey Test and the Armed Forces Qualification Test. The Stanford Diagnostic Mathematics Test is used to diagnose the specific deficiencies that need to be remediated. Criterion tests are used to determine when the student has acquired the skills covered in each module of the curriculum.

Rationale for Instrumentation

The primary reason for using the screening-diagnostic-evaluative approach in the Mathematical Skills Curriculum is that mathematical skills are interrelated and sequential. After being screened into the curriculum, the diagnostic assessment determines which skills need development. The sequence of development is an important consideration. For example, multiplication is a prerequisite skill for division. A student must be able to multiply two numbers ($3 \times 3 = 9$) before performing the inverse division operation ($9 \div 3 = 3$).

Another reason for using the particular testing approach is that the criterion tests can be patterned after the SDMT. The criterion tests that are provided for each module are similar in structure to the SDMT. Therefore, the student sees a consistent format in the diagnostic and criterion tests. The content of the criterion tests is based on the instructional and prescriptive activities in the modules. The level of difficulty of the items is controlled

by the activity content at approximately the eighth grade level. Such control assures that the criterion tests are valid for assessing the proficiency level of the students when they complete each instructional module.

Screening

The procedures used in screening students into the Mathematical Skills Curriculum may vary depending on the setting where it is implemented. The recommended procedure is to administer the Metropolitan Mathematics Survey Test in order to obtain a mathematics grade equivalent score for each individual based on the total score. An optional procedure is to use the Armed Forces Qualification Test (AFQT) score as the basis for screening.

Metropolitan Achievement Tests: Mathematics Survey Test

The Metropolitan Mathematics Survey Test, 1978 edition, is an achievement test in a series that is designed for the grade range from kindergarten through the twelfth grade. The test is standardized on a national representative sample of students that provides a normative reference for the interpretation of scores. Consequently, the items are designed to discriminate among varying levels of achievement in mathematics.

Depending on the achievement level needed by a particular student population, the Intermediate Level or the Advanced 1 Level of the Metropolitan Mathematics Survey Test is recommended for screening. The Intermediate Level is designed for the grade span of 5.0 through 6.9. The Advanced 1 Level covers the grade range of 7.0 through 9.9. The test for each level contains 50 items and requires about 40 minutes for administration. Both levels have norms that are extrapolated to cover the grade range from the first grade through the twelfth grade.

While the items for the two levels of the test differ in content and difficulty, each level measures mathematical skills in the following areas; numeration, geometry and measurement, problem solving, operations - whole numbers, operations - laws and properties, operations - fractions and decimals, and graphs and statistics. The number of items on the two levels are approximately the same for numeration, geometry and measurement, problem solving, and operations - laws and properties. The Intermediate Level has more items on operations - whole numbers while the Advanced 1 level has more items on operations - fractions and decimals, and graphs and statistics.

AFQT

The AFQT is a composite score based on four subtests of the Armed Services Vocational Aptitude Battery. The four subtests are Word Knowledge, Paragraph Comprehension, Numerical Operations, and Arithemetic Reasoning. The AFQT is derived by combining the four subtest scores and converting the combined score to a standardized score.

The Stanford Diagnostic Mathematics Test

Description

The Stanford Diagnostic Mathematics Test, 1976 edition, Brown Level, measures competence in concepts and skills that represent basic mathematical competence necessary for continued study of mathematics. Since the test measures competence in basic concepts and skills, it becomes an excellent tool to determine the entry level of the student. As a diagnostic instrument, the SDMT focuses on specific mathematical skills in more detail than do survey or general achievement tests.

The SDMT provides four levels of instruments that have two parallel forms. The Red Level is for use at grades 1-3 and low achieving pupils in grade 4. The Green Level is for use in grades 4 and 5 and low achieving pupils in grade 6. The Brown Level is intended for use in grades 6 and 7 and low achieving grade 8 and high school students. The Blue Level is designed to use with students in grade 8 through community college. This curriculum is designed using the Brown Level.

The Brown Level of the SDMT has three subtests: number system and numeration, computation, and application. A brief description of each subtest is presented below.

Number System and Numeration (Test 1)

The subtest requires that an individual demonstrate a knowledge of the number system by counting, reading and interpreting numerals, and ordering numerals. Rational numbers and common fractions are named as parts of a whole in terms of fractions. Basic numerical operations and their properties are also emphasized in this subtest.

Computation (Test 2)

The basic computational activities of addition, subtraction, multiplication, and division are essential elements of this subtest. Computational skills are also applied to fractions, decimals, and number sentences. In each case, the emphasis of this subtest is to demonstrate the ability to perform the computations.

Applications (Test 3)

Problem solving, reading and interpreting tables and graphs, and geometry and measurement are the elements of this subtest. The student must read the problems, determine the mathematical terms and operations to be applied to the

problem, and perform the operation. This is the most complex subtest because it requires higher order skills.

Scoring the SDMT

The SDMT is scored to provide information on each individual at the lowest of the three levels of item grouping: the enabling objective level. At this level of diagnosis, the responses to the test items for each enabling objective are scored. The score for each enabling objective is compared with its specified criterion performance (passing score) in order to identify those areas of deficiency for which prescriptive instruction is required.

Criterion Tests

Description

The Mathematical Skills Curriculum contains thirteen criterion tests for use with individuals diagnosed as needing help in mathematics. The criterion tests parallel the format of the SDMT. Each criterion test is designed to measure skills taught through the prescriptive instructional activities. The purpose of the criterion tests is to determine whether or not the student has remediated the identified deficiency before moving into another set of prescriptive activities.

Scoring of Criterion Tests

Each criterion test contains items that have a multiple-choice format. The student is to choose the best answer for each item. The length of the criterion tests is variable depending on the concept/skill being measured. The length ranges from ten items to fifteen items per test. Each test is scored to determine the number of correct responses made by the student.

Minimum Performance Levels on the Instruments

Minimum performance levels have been specified for the mathematics achievement, diagnostic, and criterion tests used in the Mathematical Skills Curriculum. The raw scores to pass the Metropolitan Mathematical Survey Test are presented in Table 2-1. The information in the table shows that the pass score depends on the test level, grade level, and test form. If the minimum performance desired is an 8.1 grade level, the table indicates that a minimum raw score of 39 is required on Form JS of the Intermediate Level, 38 on the Form KS of the intermediate level, 30 on Form JS of the Advanced 1 Level, or 29 on Form KS of the Advanced 1 Level.

Table 2-1

Raw Scores for Pass on the Metropolitan Mathematics Survey Test by Test level, Grade Level, and Test Form

Test Level	Grade Level	Test Forms	
		JS	KS
Intermediate	6.1	31	31
	8.1	39	38
Advanced 1	6.1	23	21
	8.1	30	29

A regression analysis of AFQT scores and MGL scores on the Metropolitan Mathematics Survey Test can be performed to produce a prediction equation. Using this equation, AFQT ranges for a 6.1 and 8.1 MGL can be obtained. Then an individual's AFQT score can be used to predict his/her MGL score when testing with the Metropolitan Mathematics Survey Test is not possible.

However, extreme caution should be exercised in using the AFQT score to screen students into the curriculum because AFQT is not likely to be a highly precise predictor of MGL for a student.

On the SDMT, a minimum performance level is specified for each enabling objective at the sixth and eighth grade levels. The levels specified for the enabling objectives are based on the subtest norms for sixth and eighth grade students on the SDMT-Brown Level. The progress indicator cutoff scores for the enabling objectives were utilized in conjunction with the subtest norms to determine the pass scores for the enabling objectives. The pass scores for the enabling objectives are presented in Table 2-2. Increases or decreases in the minimum levels may be appropriate based on factors such as the diagnostic profile of the student and the performance of the student on the screening instrument.

A minimum performance level of 80 percent correct responses is specified for each of the mathematical skills criterion tests. Since the tests are designed for the eighth grade level, a slightly lower minimum level (for example, 70 percent) may be used if an exit competency of sixth grade is stipulated. A standard performance level is specified for the criterion tests since they are intended to ascertain that a minimum proficiency level has been achieved before the student exits the module.

Table 2-2

Number of Items and Pass Scores for Enabling Objectives
Based on the SDMT-Brown Level

Enabling Objective Number	Number of Items	Pass Scores 6th Grade	Pass Scores 8th Grade
1.11	3	2	2
1.12	3	2	2
1.13	6	3	4
1.14	3	2	2
1.15	3	2	2
1.16	3	1	2
1.21	6	3	4
1.22	3	1	2
1.31	6	3	4
2.11	3	2	3
2.21	6	4	5
2.31	3	2	3
2.32	3	2	3
2.33	6	4	5
2.41	3	2	3
2.42	3	2	3
2.43	3	2	2
2.44	3	2	2
2.51	3	2	2
2.61	3	2	3
2.62	3	2	2
2.71	3	2	3
2.72	3	1	2
3.11	3	2	3
3.12	3	2	2
3.13	3	2	3
3.14	3	2	2
3.21	3	2	2
3.22	6	4	5
3.31	3	1	2
3.32	3	2	2
3.33	3	1	2
3.34	3	2	2

SECTION III

CURRICULUM AND INSTRUCTION

The Mathematical Skills Curriculum has been organized around specific objectives derived from the Stanford Diagnostic Mathematics Test (SDMT). Three general areas of instruction are found in the SDMT, namely, number system and numeration, computation, and applications.

The number system and numeration area of the curriculum includes three subsets of the SDMT. The subsets used are: whole numbers and decimal place value, rational numbers and numeration, and operations and properties. Generally, the number system and numeration area is comprised of activities that teach the recognition and discrimination of numerals. Recognition includes naming, ordering, rounding, and estimating while discrimination includes expressing parts of a whole number in terms of fractions and decimals.

Two examples will illustrate the recognition and discrimination of numerals as measured by the SDMT.

Example of <u>recognition</u>:

Which is another name for 3600?

a. 3 + 600
b. 3000 + 600
c. 3000 + 6000
d. 3000 + 6

Example of <u>discrimination</u>:

Another way to show 3 x 16 is ____.

a. (3 x 10) + (3 x 6)
b. (3 x 10) + 6
c. (3 x 6) + 10
d. (3 x 1) + (3 x 6)

Computation is the second general area of the curriculum that is structured from the SDMT. It consists of activities associated with addition, subtraction, multiplication, and division of whole numbers. The basic numerical facts are emphasized in the computations. An example, is the following:

$$36 \div 6 =$$

a. 6
b. 4
c. 8
d. 60
e. not here

Computation also includes activities related to fractions, decimals, and number sentences. In these activities, an individual must be able to add, subtract, multiply, and divide fractions and decimals as well as use elements in a parenthetical mode. The computation area of instruction ensures that individuals can understand numerical situations and perform the basic operations of mathematics.

Applications is the third area of the curriculum. It involves activities associated with problem solving, reading and interpreting graphs and tables, and geometry and measurement. The individual must be able to deal with numerals in contextual situations. He learns to solve problems from short passages and to identify those operations needed to solve the problem. An example is the following:

Joe can run 5 blocks in 12 minutes. At this rate how many blocks can he run in one hour?

(a) 15 (b) 24 (c) 25 (d) 50 (e) not here

The example requires that the individual read and understand the problem as well as perform the operations of division and multiplication.

The applications aspect of the curriculum requires a higher level of understanding. It requires that the individuals build on their knowledge

base, make inferences, and apply general knowledge to what they read in the problem. These types of activities hold the key to understanding and using mathematics in Navy job performance.

Scope and Sequence of the Curriculum

The three areas of the mathematics curriculum have been organized into thirteen modules, each of which requires specific instruction, prescription, and evaluation. The modules are developmentally sequenced so that the first areas listed represent the simplest of the mathematical skills. Figure 3-1 shows the developmental sequence of the mathematical skill modules.

Assignment of Instructional Modules

The assignment of individuals to the thirteen modules is based on the results of the SDMT. Since modules correspond to terminal objectives, a deficiency on one enabling objective within a terminal objective requires that the individual be assigned to the related module. Review and remediation focus on the enabling objectives for which the individual is deficient.

In placing the individuals in a module, the following guidelines should be observed.

1. Instructional materials must be understood by the individual. This will require instruction that may be given individually or in groups depending on the number of individuals who have deficiencies with the skill.
2. Practice should be monitored after the instruction to insure that the individual understands "what and why" he is completing a skill prescription. Often, individuals perform functions in a rote fashion without understanding. When this happens, forgetting is enhanced.

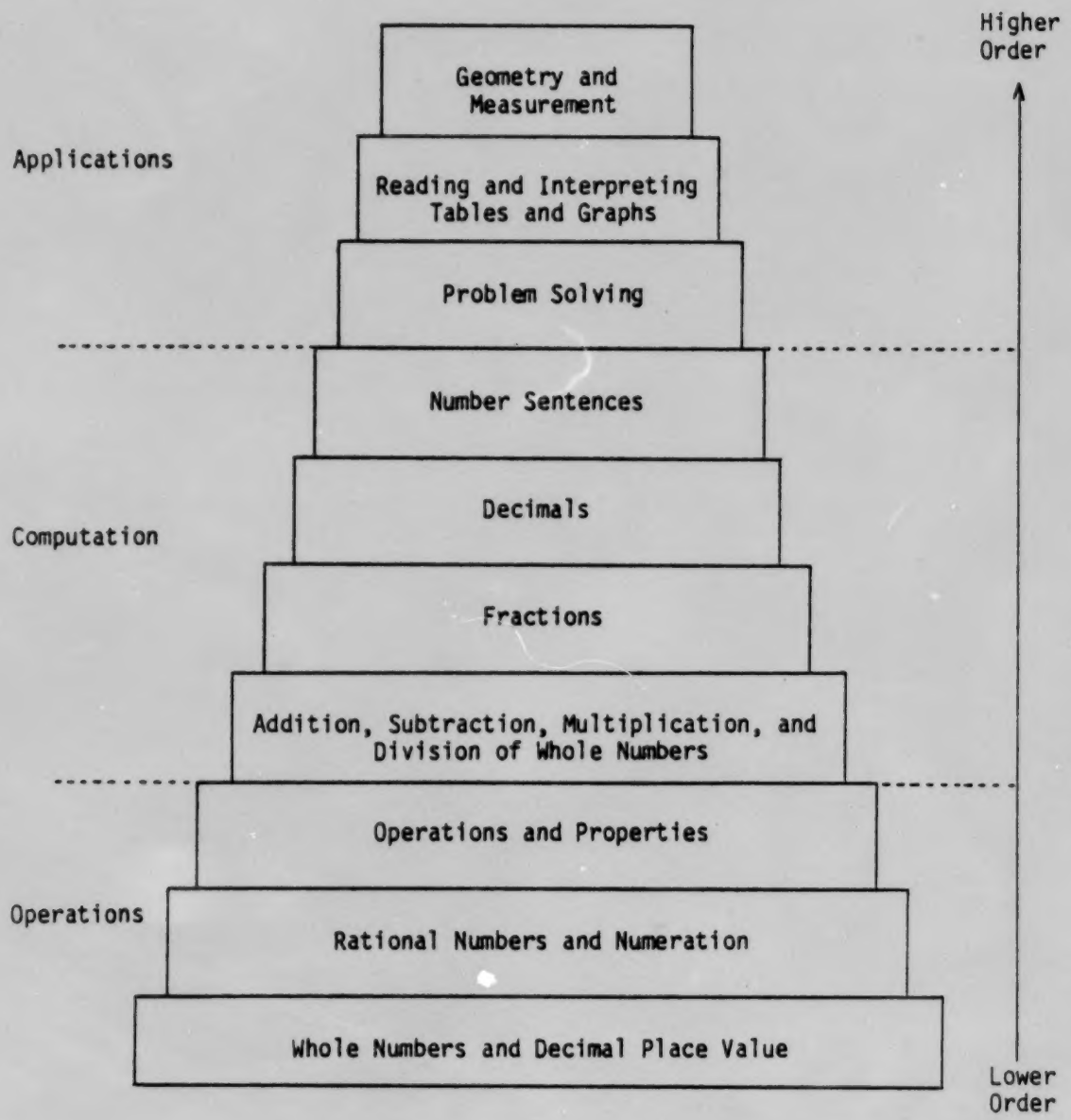


Figure 3-1. Developmental Sequence of Mathematical Skills Modules

EXIT Requirements for Instructional Modules

Once an individual has been placed in an instructional module, he works toward exit that is determined by a criterion test which represents a sample of the skills taught within a particular module. The criterion test is representative of the instructional material. Passing the criterion test represents progress in the development of mathematical skills and will help ensure that the individual would perform equally well on standardized examinations dealing with the same skill.

The exit requirements relate directly to the terminal objective for each module. The criterion tests have been developed at the terminal objective level. The criterion test items follow the same format as items within the SDMT using the content of the materials in the curriculum.

Although individuals exit each module, one must be cautious in interpreting this as skill "mastery." Learning to perform mathematical operations requires time and understanding. Practice and additional training over a longer period of time will be required for true "mastery" of the skill. However, the performance on the criterion tests is an indicator that the individual is on the road toward mastery.

Instructional Materials

The curriculum and instructional modules have been designed to remediate specific skill deficiencies identified through the SDMT. A variety of materials have been incorporated into most modules. These materials were chosen because (1) they contained content that was appropriate for the skill, (2) the content is applicable for adults - not children, and (3) they are attractive in appearance and durable in manufacture.

Two sets of materials have been chosen especially for the instructors. These materials are Mathematics and Your Career (Amsco School Publications,

New York, 1978) and Arithmetic Skill Workbook (Amsco School Publications, New York, 1973). These were chosen because they have suggestions on how to present a mathematical skill, examples to use for the instructional time, and mathematical problems that can be used as practice items with the students.

Many of the other curricular materials have suggestions about teaching strategies that will also be useful to the instructor. These should be used to the extent possible within the classroom. It should be pointed out that not all parts of any set of material have been incorporated into the curriculum. The materials have been screened and analyzed with only those portions directly related to the mathematical skills of the curriculum being incorporated into the prescriptions.

Organization of the Instructional Program

A sample schedule for mathematical instruction is shown in Figure 3-2. This shows an organizational outline of the modules and how they may be assigned for specific days. After testing and orientation, the individual enters only those modules where he is deficient. The individual may enter on any given date; therefore, his schedule will be different from that of other individuals. Each individual continues to work in the assigned skill until remediation is achieved. Then he begins to work on the next higher order remediation area.

Several items must be remembered about the schedule:

1. The curriculum is an open entry-open exit one. Individuals will be entering and/or leaving the program each day.
2. The schedule is only suggestive. Each individual will have his own schedule based on his deficiencies identified by the SDMT.

AREA	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Operations	Diagnostic Testing Orientation Initial Assignment	1. Naming Numbers 2. Reading Numerals 3. Interpreting Numerals	1. Place value and operations 2. Ordering 3. Rounding and Estimating	1. Common Fractions 2. Decimals 3. Operations	1. Common Fractions 2. Decimals 3. Operations
Computation	1. Addition-Whole Numbers 2. Subtraction-Whole Numbers	1. Addition/Subtraction of whole Numbers	1. Multiplication-Basic Facts	1. Multiplication-Partial Products	1. Division-Basic Facts
Computation	1. Division with Remainders	1. Division-Two/Three Digit Numbers	1. Fractions-Addition and Subtraction	1. Fractions-Multiplications	1. Number Sentences
Application	1. Problem Solving	1. Reading Graphs and Tables 2. Problem Solving	1. Geometric Shapes 2. Problem Solving 3. Reading Graphs and Tables	1. Review Exercises of all Deficiencies	EXIT

Figure 3-2. Sample Schedule for Mathematical Instruction

3. Criterion testing will occur based on the ability of the individuals to perform on the prescriptive activities and based on the judgement of the instructor.
4. Each center using the curriculum will need to develop its own master schedule for expedient use of instructor time.
5. Student behavior is fluid. Some individuals will be doing individualized study while others will be attending lectures.

SECTION IV

INSTRUCTIONAL PROCEDURES

The Mathematical Skills Curriculum is designed to promote individualized instruction for students who are taught using this curriculum. An individualized instructional approach requires that the instructor know the specific deficiencies of the students and know what steps to take in remediating the identified deficiencies. The SDMT has been incorporated into the curriculum in order to provide a tool for identifying the deficiencies of each student.

The remediation of deficiencies involves well-planned learning experiences for students. The instructional strategies and steps described below can be used by instructors to direct students in attaining their objective, that is, remediation. There is no single strategy that can guarantee success to an instructor in working with all students. However, the strategies and steps for conducting instruction that are described below have been effective for many teachers over the years. Thus, they are offered as recommended approaches to use in the instructional process.

Instructional Strategies

The design of the Mathematical Skills Curriculum encourages the use of several instructional strategies. A variety of these strategies can be used in the classes. Some of the more important strategies - large groups, small groups, individual conferences, questioning, and tutoring - are reviewed to help the instructor.

Grouping Patterns

Large groups, small groups, and individual conferences should be evident in the classroom. Large group activities are good for orientation, testing, and the initial teaching or introduction of mathematical skills. Lectures,

demonstrations, films, reviews, and motivational sessions can be carried out effectively in large groups. Larger blocks of information can be conveyed in these sessions.

However, large groups often allow a student to drift away from the specific purpose of the group session because he can lose himself in large numbers of students. When teaching large groups, the instructor is encouraged to use feedback information from his class. He should keep eye contact, ask questions and then direct them, and reinforce what has been said in class by writing or visualizing the material on the board.

Small groups should be structured to teach and reteach specific mathematical skills. Small groups will vary in size but should probably be no larger than six students. To use instructional time effectively, an instructor must group students. The small group instructional pattern will be useful to the instructor when he needs to provide drill and practice using problems that require knowledge of two or more skills.

An additional benefit of small group instruction occurs when individual students are given leadership roles within each group. They can learn from one another in a shared learning experience. This type of activity relieves the instructor of some of the heavy burden of teaching. For example, students can explain how a particular set of material is used or how it is scored, checked, or recorded. Within a group, a student can distribute and check materials. Whatever the case, the instructor should feel free to allow students to work in small groups and, in the process, assign specific responsibilities that enable him to accomplish more important teaching tasks.

Individual conferences are also useful instructional tools. With a potential ratio of 15 students to each instructor, it is expected that each student should have at least two 15-minute conferences a week. Three kinds

of things happen in conferences. First, conferences are information gathering sessions that can provide useful information about how an individual is progressing. This information provides the substance for the second aspect of a conference: teaching. The teaching usually stems from the miscues gathered and recorded during the first phase. This is sometimes called incidental teaching for it is done instantly as the need arises without much preparation on the part of the instructor. Lengthy instruction should be avoided in this type of teaching. If it is required, it should be rescheduled for another time and the instructor should seek other students who need the same or similar help.

The third kind of activity that takes place in a conference concerns counseling. This conference activity often occurs when a student fails to achieve what has been programmed for him in his academic and military training. In this situation, the instructor may need only to listen to an individual relate his troubles. He may find it necessary to question or talk about the problems in greater depth or detail. If this is the case, then additional time should be scheduled for counseling in greater depth.

Questioning

Questioning is a basic tool that should be used by an instructor to approach instruction because it enables him to exchange information with, to solicit information from, and to evaluate understanding of those being taught. The use of questions to exchange information is extremely beneficial because the instructor can immediately assess the degree to which the student understands what is asked of him. Assessing student progress through questioning is important. Its use with multiplication tables and knowledge of basic arithmetic facts is almost unlimited.

Questioning also helps to arouse interest on the part of the student. In question and answer sessions, the student must listen to what is being discussed and must concentrate on the operations associated with it. These sessions also provide the benefit of students being actively involved in learning.

Tutoring

Tutoring is an instructional strategy that can be used whenever an individual needs specific help. Usually, the strategy is used to help those students who are having undue difficulty in mastering a concept or skill. The instructor, in a tutoring situation, must use every technique available to him to help the individual grasp what is being taught. Tutoring requires questioning, reviewing, and responding on the part of both the instructor and the learner.

Since tutoring is an individualized approach, the instructor must use care to insure that the student does not feel isolated and rejected. The tutoring process requires much sensitivity and patience on the part of the instructor.

Instructional Steps

There are six instructional steps that should be employed in each lesson or lecture which are evident in all good teaching regardless of subject matter or instructional level. Recent research verifying their importance indicates that the instructor may be the most significant factor in determining the limits of a student's achievement. The steps described below should be followed in each lecture session or lesson conducted by the instructor.

Preparation

Preparation occurs before the instructor meets with his class. This is a time for reviewing class records, checking tests, marking worksheets, or correcting other previous assignments. The instructor may review his master schedule to determine what he has taught and what needs to be taught, to identify which individuals need additional work, or to identify students who are ready for a criterion test. The preparation period is a time for sorting out information, deciding "who" and "what" to teach, or selecting specific instructional activities.

Materials for a lesson are important. They must be selected and assigned to students for specific practice or drill during the lecture period. The instructor must have all materials ready for every facet of the lesson. In brief, everything for teaching a lesson for the next period must be prepared before time for the class to begin.

Readiness

Readiness is the state of a lesson when an instructor meets his students. Every instructional day needs a readiness period of some type designed to ascertain the academic and motivational needs of the students. The first task is to take care of the administrative details before teaching begins. The instructor will note attendance, read announcements, review or highlight any rules or regulations, and get out the instructional supplies for the day. These tasks should help the students relax and assist the instructor in his endeavor to control the focus of attention.

In the readiness phase of a lesson, the instructor will outline the activities of the day. He will present a general instructional outline so that each person knows the sequence of events for the lecture period. The outline reveals the instructor's intent or purpose. Specific topics or skills

to be taught will be listed. Grouping plans and individual assignments will be explained with specific time constraints accompanying each. Instructors will encourage students during this stage. Positive attitudes are important. They are fostered by the completion of tasks in an orderly manner. Students should be reminded to turn in their completed work and to plot their progress or advancement through the curriculum. They should also be reminded of the importance of the academic work for it is their route to success in the Navy.

Instruction

During instruction time, the instructor will have direct control at all times. Skilled instructors may find that they teach smaller groups or individuals while they have other students gainfully employed at other learning tasks. In the instructional phase of the lesson, the instructor will demonstrate a skill, explain a process, or illustrate a point to be learned. It is a part of an overall lesson that demands special materials. The instructor will have lecture notes, handouts, films, or other materials specifically designed to teach.

During this time, the instructor will actively teach. He will question them, have them write, work with them at the board, and otherwise involve them in the learning process. This <u>involvement</u> is important in the teaching process. Instructors should strive to include as much involvement as possible. While it is generally understood that this is an instructor's lecture time, it is also understood that the instructor should involve the students actively so that there is as much interaction as possible.

New instructors may find answering a question with a question a useful strategy in promoting responses. This technique allows the student to answer his own question. If not, another student may. This interaction promotes active thinking and learning.

A summary of the actions of both instructors and students during the lecture period is shown in Figure 4-1. The instructor should be aware that learning comes through an understanding of the skill being taught. In order for the student to understand what is being taught, the instructor must perform designated actions. Concurrently, the student must share some of the responsibility for learning by performing associated actions. When both the actions of the student and the instructor are meshed, maximum learning and understanding of the skill will occur.

Drill and Practice

The fourth stage of a lesson requires an individual to try a newly learned skill on his own. Once a new skill has been taught in the instructional stage of the lesson, drill and practice on that skill should be assigned to each student individually. The instructor should require each student to try out or practice the skill that has been taught.

This type of activity often requires the assignment of different exercises for each individual in the class. Here, the experienced instructor learns to differentiate between assignments and allows the students to work at different levels or with different materials while the same skill is being practiced.

Drill and practice under supervised conditions is a necessary ingredient of a total lesson. It is a stage that commits the learner to a task. He has to do it on his own with the instructor being there to supervise and assist when needed. It is a time of rather intense activity when misunderstandings and questions arise. Immediate reinforcement or rewards can be applied at this stage to encourage the student to continue. The more confidence that a student gains during the drill and practice, the more likely he is to succeed on his own in situations outside of the classroom.

Instructor's Action	Student's Action
1. Describes a skill, concept, process, or task using: a. verbal explanation b. visual media	1. Listens to description given by instructor and makes notes
2. Asks questions to determine degree of understanding at the level of: a. recall (knowledge) b. rewording (comprehension) c. implication (application)	2. Answers questions asked by instructor and asks clarifying questions
3. Assigns practice exercises on the skill, concept, process, or task that range from simple to more difficult	3. Does practice exercise assigned by instructor (worksheets or board work)
4. Monitors practice exercises by moving among students and observing work	4. Asks for assistance when needed
5. Conducts a review of the skill, concept, process, or task by summarizing critical points	5. Listens to review, seeking clarification when needed
6. Assigns reinforcement exercises, if needed	6. Completes reinforcement exercises

Figure 4-1. Actions of Instructors and Students in the Lecture Session

The drill and practice stage of the lesson is the stage where the student demonstrates the skill taught in the lesson. Some learners will require practice periods that are longer and more intense than will others. This is not unusual. In these instances, the instructor needs to remain with the student and, if necessary, recycle him through the instructional stage of the lesson.

Drill and practice materials are separate from other materials used in the lesson. These are the consumable materials that take the form of ditto sheets or workbook pages. They are not randomly assigned but are specially assigned to reinforce a particular skill and to form the basis for an individualized approach to instruction. The skill prescriptions contain listings of materials that should be used for enrichment and reinforcement of the skills taught in the lecture.

Evaluation

Evaluation takes place when an instructor checks a student's progress to see if the instructional objective has been achieved. Evaluation is easily understood as a test applied at the end of a lesson. The test should be carefully constructed and reflect precisely what has been taught. In this phase, the instructor needs to learn how to frame good questions. Because specific enabling objectives have been built into the mathematics curriculum, the instructor should have little difficulty teaching and testing for specific objectives.

Evaluation may take a variety of forms and need not be viewed only as a written test. Oral questioning, working problems at a blackboard, or having a student work specific mathematical problems may be considered methods of evaluation. If a student can perform satisfactorily, he should be advanced into the next skill area that needs remediation. If he cannot perform the task, he must be recycled through more teaching of the skill.

Follow-Up or Application

Skills learned and not applied are soon lost. Follow-up or application activities take the student out of the classroom and encourage the use of the newly acquired skills in some practical way. Follow-up activities will most likely be useful in situations that demand study, personal adjustment, and/or counseling. It is recommended that instructors use follow-up activities to aid or assist the student in studying from Navy manuals and materials.

Preparation, readiness, instruction, drill and practice, evaluation and follow-up are all part of a well-taught lesson. These stages form the basis of good teaching. Remedial instruction is always planned instruction. It is based on the apparent needs of the individual and, as such, is always individualized. Diagnostic prescriptions are aimed at specific deficiencies that should be evident to both the teacher and the student as measured by the SDMT.

In summary, the curriculum requires a special and systematic kind of instruction that places a great demand on the instructor for effective teaching. Lesson plans must be prepared carefully; specific materials should be prepared for each class; and students' needs must be met as they are demonstrated in class.

SECTION V

INDIVIDUALIZED INSTRUCTIONAL MANAGEMENT SYSTEM

Management of the instructional process is crucial to the success of the student in the Mathematical Skills Curriculum. The management system has been developed to provide prompt information to anyone who wants to know about the progress of the student. The instructor plays the significant role in the success of the management system because he assigns the skill prescriptions, maintains the instructional management record, and monitors the skill folders.

Skill Prescriptions

The skill prescriptions provide the information needed for individualization of instruction. Each skill prescription contains four types of information: (1) identification, (2) enabling objective, (3) instructions, and (4) materials. The identification includes the specific skill (e.g. Computation - Addition of Whole Numbers) and the enabling objective (e.g. 1.11). The enabling objective states the behavior that the student should be able to perform at the completion of the assigned prescriptive activities.

The instructions give directions to the student for completion of the activity. The instructor as well as the student must be aware of what is to be accomplished because, in some cases, the instructor may be required to give additional guidance before the student can begin to work on the assigned prescriptive activities.

The materials are the heart of each prescription because they represent those remediation resources that the student will use to overcome his deficiency. If a prescription has several remedial materials listed, only selected materials will be assigned for the student to use in practicing the skill being remediated. In those cases, individualization is provided through the

instructor's choices of materials for each student. On a larger scale, individualization is achieved through the assignment of the student to work on only those prescriptions related to his identified deficiencies.

Instructional Management Record

The purpose of the Instructional Management Record (IMR) is to maintain a record of the student's progress. The IMR contains (1) personal data including name, social security number, and dates of entry and exit into the Mathematical Skills Curriculum, (2) mathematical scores obtained on the screening instrument, (3) deficiencies identified from analysis of the Stanford Diagnostic Mathematics Test, and (4) criterion test scores. The instructor will be required to maintain the IMR so that he can continually monitor the progress of the learner. (See Figure 5-1.)

Skill Folder

The skill folder is a personal record maintained by the student. It contains the prescriptions that are to be completed. After completing a remediation activity, the student records this information on the prescription. The value of the skill folder is that the learner has his own record of the progress that he is making in remediating his deficiencies. The elements of the skill folder are (1) a file folder and (2) a prescription sheet for each deficiency addressed by the student.

Facilitating Student Progress

Several elements of the instructional phase must be constantly monitored and handled by the instructor. For example, planning for instruction is essential in order to be effective. The instructor must be knowledgeable about those students assigned to him. The instructor will plan appropriate large-group instructional activities that will benefit several students as they progress through the program.

INSTRUCTIONAL MANAGEMENT RECORD
MATHEMATICAL SKILLS CURRICULUM

I. Personal Data:

Name _____ Soc. Sec. No. _____

Program Entry Date _____ Exit Date _____

II. Score obtained on Screening Test:
Metropolitan Mathematics Survey Test _____
AFQT _____

III. Deficiencies based on Stanford Diagnostic Mathematics Test:
Check those objectives for which the student is deficient.

Number System and Numeration

Whole Numbers and Decimal Place Value
1.11 _____
1.12 _____
1.13 _____
1.14 _____
1.15 _____
1.16 _____

Rational Numbers and Numeration
1.21 _____
1.22 _____

Operations and Properties
1.31 _____

Computation

Addition of Whole Numbers
2.11 _____

Subtraction of Whole Numbers
2.21 _____

Multiplication of Whole Numbers
2.31 _____
2.32 _____
2.33 _____

Division of Whole Numbers
2.41 _____
2.42 _____
2.43 _____
2.44 _____

Fractions
2.51 _____

Decimals
2.61 _____
2.62 _____

Number Sentences
2.71 _____
2.72 _____

Applications

Problem Solving
3.11 _____
3.12 _____
3.13 _____
3.14 _____

Reading/ Interpreting Tables/Graphs
3.21 _____
3.22 _____

Geometry and Measurement
3.31 _____
3.32 _____
3.33 _____
3.34 _____

IV. Criterion Test Scores:
Record the score for each attempt on a criterion test.

Number System and Numeration

1.10 ___ ___ ___ 1.20 ___ ___ ___ 1.30 ___ ___ ___

Computation

2.10 ___ ___ ___ 2.20 ___ ___ ___ 2.30 ___ ___ ___ 2.40 ___ ___ ___
2.50 ___ ___ ___ 2.60 ___ ___ ___ 2.70 ___ ___ ___

Applications

3.10 ___ ___ ___ 3.20 ___ ___ ___ 3.30 ___ ___ ___

Figure 5-1. Instructional Management Record Form

ACTIVITY COMPLETED	DATE COMPLETED	ACTIVITY COMPLETED	DATE COMPLETED

Figure 5-1 (Continued). Instructional Management Record Form

Sequencing the instruction is an element that is completed by the instructor. Knowledge of the student's needs is vital at this point. Proper sequencing of the remediation will enable the student to spend minimal time in the program.

The monitoring of mathematical skill development by individual students must be conducted in the atmosphere of concern for the learner. Through praise and interest, the instructor can boost the student's morale. Additionally, the instructor must constantly ask and evaluate several basic questions:

1. Is the student applying his time most efficiently?
2. Is the student using the materials properly?
3. Are the materials of interest to the student? Should other materials from the prescriptions be selected?
4. Does the student need encouragement?
5. Has the student maintained his record of activities completed?
6. Is the student ready for the criterion test? Should other activities be completed prior to taking the criterion test?
7. To what extent should the student be recycled through the skill development activities?

These basic questions require that the instructor make decisions about the remediation and progress of students. Failure to continually ask these questions may result in the failure of the student to remediate his mathematical deficiencies and failure of the student to improve his potential contribution in Navy job performance.

LISTING OF RESOURCES
MATHEMATICAL SKILLS CURRICULUM

1. SRA Computational Skills Development Kit - 1980 Edition
   Science Research Associates, Inc.; Chicago, IL 1980

2. Mathematics and Your Career
   Amsco School Publications, Inc.; New York, NY 1978

3. Arithmetic Skills Workbook
   Amsco School Publications, Inc.; New York, NY 1973

4. Programmed Math for Adults: Book II - More Personal Math
   Webster Division, McGraw-Hill Book Company: New York, NY 1977

5. Programmed Math for Adults: Book I - Basic Addition
   Webster Division, McGraw-Hill Book Company; New York, NY 1976

6. Arithmetic Module Series: Complete, Non-Programmed Edition
   Addison Wesley Publishing Company; Reading, MA 1976

7. Steps To Mathematics - Book 2
   Steck - Vaughn Company; Austin, TX 1975

8. Basic Essentials of Mathematics - Part 1
   Steck - Vaughn Company; Austin, TX 1975

9. Basic Essentials of Mathematics - Part 2
   Steck - Vaughn Company; Austin, TX 1975

10. The Learning Skills Series: Arithmetic
    Acquiring Arithmetic Skills
    Building Arithmetic Skills
    Continuing Arithmetic Skills
    Directing Arithmetic Skills
    Webster Division, McGraw-Hill Book Company; New York, NY 1976

11. Preparation for High School Equivalency in Mathematics - Book 5
    Steck - Vaughn Company; Austin, TX 1978

12. Improving Your Navy Numerical Skills
    Training Analysis and Evaluation Group, Department of the Navy;
    Orlando, FL 1980

MATHEMATICAL SKILLS CURRICULUM
SKILL PRESCRIPTIONS

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Naming Numbers and Counting

ENABLING OBJECTIVE: Given an instructional format using number series and number lines, the student will be able to complete counting patterns with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills				
Chapter 2, Page 31, Problem Counting by 3's	_____	_____	_____	_____
Steps to Mathematics - Book 2				
Lesson 1, Page 1, Problem 3-6	_____	_____	_____	_____
Directing Arithmetic Skills				
Chapter 1, Page 17, Problem Counting by 2'2	_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Acquiring Arithmetic Skills							
Chapter	Page	Problem					
1	13	Counting by 5's, 10's					
1	17	Counting by 2's					
1	21	Counting by 10's					
1	23	Counting by 5's					
Arithmetic Module Series: Complete, Non-Programmed							
Module	Unit	Page	Problem				
1	1	6	1-3				
1	1	10	12-13				

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Reading Numbers

ENABLING OBJECTIVE: Given a series of four-digit to eight-digit numbers including numbers with zero digits, the student will be able to read the numbers with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 1						
Unit 1	Page 10	Problem 1-14	_____	_____	_____	_____
Arithmetic Skills Workbook						
Unit 1	Page 1-4	Problem 1-35	_____	_____	_____	_____
Mathematics and Your Career						
Chapter 1	Page 5-6	Problem Tryouts: 1-6	_____	_____	_____	_____
1	6-7	Are You Ready: 1-10	_____	_____	_____	_____

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5				
Exercise 1, Page 6, Problem A-C	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed				
Module 1, Unit 1, Page 5, Problem 1-4	_____	_____	_____	_____
Module 1, Unit 1, Page 7, Problem 1-3	_____	_____	_____	_____
Module 1, Unit 1, Page 8, Problem 1-3	_____	_____	_____	_____
Module 1, Unit 1, Page 9, Problem 1-21	_____	_____	_____	_____
Module 1, Unit 1, Page 10, Problem 14-24	_____	_____	_____	_____

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Interpreting Numbers

ENABLING OBJECTIVE: Given a series of numerals in expanded form and standard form, the student will be able to interpret these numerals in opposite forms and determine the value of digits in numerals with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Mathematics and Your Career				
Chapter 1 — Page 5-6 — Problem Tryouts: 1-6	_____	_____	_____	_____
Steps to Mathematics - Book 2				
Lesson 1 — Page 1 — Problem 1-2	_____	_____	_____	_____
Arithmetic Skills Workbook				
Unit 1 — Page 3-5 — Problem 16-25	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed				
Module 1 — Unit 1 — Page 5 — Problem (Exercises)	_____	_____	_____	_____

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 1				
Unit 1 Page 10 Problem 1-14	_____	_____	_____	_____

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Place Value and Operations

ENABLING OBJECTIVE: Given a series of numerical problems, the student will be able to name the missing digit in the solutions to the problems with an accuracy of 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Programmed Math for Adults							
Book 1	Page 61-67	Problem (Exercises)		_____	_____	_____	_____
1	93-95	(Exercises)		_____	_____	_____	_____
SRA Computational Skills Development Kit							
Color Red	Topic Division	Card 13	Problem (Exercises)	_____	_____	_____	_____
Red	Division	14	(Exercises)	_____	_____	_____	_____
Red	Division	15	(Exercises)	_____	_____	_____	_____
Red	Division	16	(Exercises)	_____	_____	_____	_____

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Ordering

ENABLING OBJECTIVE: Given a number series, the student will be able to identify the missing number in a series, order the numbers by identifying the largest number in a series, and naming the number of odd or even numbers in a series with an accuracy of 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skills Development Kit							
Color	Topic	Card	Problem				
Gold	Introduction	8a	(Exercises)	_____	_____	_____	_____
Gold	Introduction	8b	(Exercises)	_____	_____	_____	_____
Steps To Mathematics - Book 2							
Lesson	Page	Problem					
1	1	5-6		_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed							
Module	Unit	Page	Problem				
1	1	6	(Exercises)	_____	_____	_____	_____
1	1	9	8-9	_____	_____	_____	_____
1	1	10	10-11	_____	_____	_____	_____

WHOLE NUMBERS AND DECIMAL PLACE VALUE
Rounding and Estimating

ENABLING OBJECTIVE: Given sets of numbers, the student will be able to round the numbers to approximations and estimate products with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook				
Unit 2 Page 5-7 Problem 1-48	_____	_____	_____	_____
Preparation for the High School Equivalency in Mathematics - Book 5				
Exercise 15 Page 34 Problem (A-F)	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed				
Module 1 Unit 8 Page 69 Problem 1-4	_____	_____	_____	_____
1 8 74-75 1-4	_____	_____	_____	_____

RATIONAL NUMBERS AND NUMERATION
Common Fractions

ENABLING OBJECTIVE: Given a series of fractions, the student will be able to name a designated part of a unit as a common fraction, rename fractions, and determine the largest or smallest fraction with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5						
Exercise 6	Page 17	Problem 1-7	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 1						
Unit 2	Page 33	Problem 1-8	_____	_____	_____	_____
2	34	1-11	_____	_____	_____	_____
2	67	2	_____	_____	_____	_____
Arithmetic Skills Workbook						
Unit 22	Page 66-69	Problem 1-20	_____	_____	_____	_____
23	70-74	1-32	_____	_____	_____	_____

55

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook							
Unit	Page	Problem					
24	75-77	1-24		_____	_____	_____	_____
25	72-79	1-16		_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed							
Module	Unit	Page	Problem				
2	1	85-94	(Exercises)	_____	_____	_____	_____

RATIONAL NUMBERS AND NUMERATION
Decimals

ENABLING OBJECTIVE: Given a series of decimals, the student will be able to identify the largest and smallest decimals and rename decimals as common fractions with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 1						
Unit 3	Page 65	Problem 1-23	_____	_____	_____	_____
3	66	1-8	_____	_____	_____	_____
3	67	1-3	_____	_____	_____	_____
3	68	1-10	_____	_____	_____	_____
3	69	1-9	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed						
Module 3	Unit 1	Page 167-175 Problem (Exercises)	_____	_____	_____	_____

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit 41	Page 129	Problem 1-2				
42	131	1-14				
43	133	1-24				
44	135	1-18				
Mathematics and Your Career						
Chapter 4	Page 98	Problem 1-4				
SRA Computational Skills Development Kit						
Color Gold	Topic Decimals	Card 6a	Problem (Exercises)			
Gold	Decimals	6b	(Exercises)			
Gold	Decimals	8a	(Exercises)			
Gold	Decimals	8b	(Exercises)			
Green	Percent	5	(Exercises)			
Green	Percent	6	(Exercises)			
Green	Percent	7	(Exercises)			
Green	Percent	8	(Exercises)			

OPERATIONS AND PROPERTIES

ENABLING OBJECTIVE: Given a series of fundamental operations, the student will demonstrate an understanding of the operations by identifying number factors and applying the distributive and inverse properties with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 1				
Unit 1, Page 16, Problem 1-9	_____	_____	_____	_____
Preparation for High School Equivalency in Mathematics - Book 5				
Exercise 21, Page 46, Problem A,B	_____	_____	_____	_____
Exercise 24, Page 53, Problem A-C	_____	_____	_____	_____
Exercise 25, Page 54, Problem 1-6	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed				
Module 2, Unit 6, Page 149-160, Problem (Exercises)	_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skills Development Kit							
Color	Topic	Card	Problem				
Blue	Introduction	1	(Exercises)	_____	_____	_____	_____
Blue	Introduction	2	(Exercises)	_____	_____	_____	_____
Blue	Introduction	3	(Exercises)	_____	_____	_____	_____
Blue	Introduction	4	(Exercises)	_____	_____	_____	_____
Blue	Introduction	5	(Exercises)	_____	_____	_____	_____
Blue	Introduction	6	(Exercises)	_____	_____	_____	_____

ADDITION OF WHOLE NUMBERS
Renaming

ENABLING OBJECTIVE: Given addition problems, the student will be able to find the sums of the numbers with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Directing Arithmetic Skills						
Chapter 1	Page 6	Problem 1-5	_____	_____	_____	_____
1	19	1-3	_____	_____	_____	_____
2	27	1-5	_____	_____	_____	_____
2	30	1-9	_____	_____	_____	_____
2	35	10-13	_____	_____	_____	_____
3	62	6	_____	_____	_____	_____
Steps to Mathematics - Book 2						
Lesson 11	Page 11	Problem 1-5	_____	_____	_____	_____
12	12	1-9	_____	_____	_____	_____

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Steps to Mathematics - Book 2 (continued)				
Lesson 13, Page 13, Problem 1-9				
Lesson 14, Page 14, Problem 1-5				
Lesson 15, Page 15, Problem 1-6				
Lesson 17, Page 17, Problem 1-8				
Lesson 18, Page 18, Problem 1-8				
Lesson 19, Page 19, Problem 1-6				
Building Arithmetic Skills				
Chapter 1, Page 10, Problem 1-25				
Chapter 1, Page 14, Problem 1-33				
Chapter 1, Page 17, Problem 1-30				
Chapter 2, Page 30, Problem 1-40				
Continuing Arithmetic Skills				
Chapter 1, Page 4, Problem 1-16				
Chapter 1, Page 5, Problem 1-7				
Chapter 1, Page 8, Problem 1-5				

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills (continued)							
Chapter 2	Page 27	Problem 1-6		_____	_____	_____	_____
2	30	1-10		_____	_____	_____	_____
2	35	8-13		_____	_____	_____	_____
2	41	1-4		_____	_____	_____	_____
Arithmetic Skills Workbook							
Unit 3	Page 10-12	Problem 1-42		_____	_____	_____	_____
4	13-15	1-14		_____	_____	_____	_____
5	16-17	1-8		_____	_____	_____	_____
Improving Your Navy Numerical Skills							
Topic Addition	Lesson 1	Page 6-8	Problem 1-30	_____	_____	_____	_____
Addition	2	9-10	A: 1-15 B: 1-15	_____	_____	_____	_____

SUBTRACTION OF WHOLE NUMBERS
Renaming

ENABLING OBJECTIVES: Given subtraction problems, the student will be able to find the differences with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit 6	Page 20-23	Problem 1-49	_____	_____	_____	_____
7	23-25	1-47	_____	_____	_____	_____
8	26-28	1-38	_____	_____	_____	_____
Continuing Arithmetic Skills						
Chapter 1	Page 10	Problem 1-6	_____	_____	_____	_____
1	19	5-8	_____	_____	_____	_____
1	25	1-5	_____	_____	_____	_____
2	28	1-5	_____	_____	_____	_____
2	32	7-10	_____	_____	_____	_____

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills (continued)						
Chapter 2	Page 33	Problem 1-7				
2	37	1-5				
2	39	10-14				
2	42	8				
2	43	1-5				
2	50	1-5				
Steps To Mathematics - Book 2						
Lesson 23	Page 23	Problem 1-7				
24	24	1-3				
25	25	1-8				
26	26	1-8				
Building Arithmetic Skills						
Chapter 1	Page 6	Problem 1-35				
1	7	1-11				
1	8	1-14				
1	9	1-35				

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Building Arithmetic Skills (continued)							
Chapter 1	Page 11	Problem 1-30		_____	_____	_____	_____
1	15	1-18		_____	_____	_____	_____
Improving Your Navy Numerical Skills							
Topic	Lesson	Page	Problem				
Subtraction	1	13-15	1-20	_____	_____	_____	_____
Subtraction	2	16-19	A: 1-20 B: 1-20	_____	_____	_____	_____

MULTIPLICATION OF WHOLE NUMBERS
Basic Facts

ENABLING OBJECTIVE: Given multiplication problems, the student will be able to name the product of two factors with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Steps to Mathematics - Book 2						
Lesson	Page	Problem				
33	33	1-6	_____	_____	_____	_____
34	34	1-7	_____	_____	_____	_____
35	35	7	_____	_____	_____	_____
36	36	1-7	_____	_____	_____	_____
37	37	1-7	_____	_____	_____	_____
Acquiring Arithmetic Skills						
Chapter	Page	Problem				
2	32	Multiplication	_____	_____	_____	_____
2	37	5	_____	_____	_____	_____

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Acquiring Arithmetic Skills (continued)						
Chapter 2	Page 45	Problem 1-4				
2	49	Multiplication				
3	52	Entire Page				
3	53	Entire Page				
3	54	1-17				
3	56	1-4				
Building Arithmetic Skills						
Chapter 1	Page 23	Problem 1-17				
1	24	1-4				
Improving Your Navy Numerical Skills						
Topic Multiplication	Lesson 1	Page 24	Problem 1-20			

100

99

MULTIPLICATION OF WHOLE NUMBERS
Ranaming Without Partial Product

ENABLING OBJECTIVE: Given a series of multiplication problems with renaming and without partial products, the student will be able to find the product of a factor in the tens or hundreds and a factor between 2 and 9 with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit 10	Page 32-35	Problem 1-31	_____	_____	_____	_____
11	35-37	1-27	_____	_____	_____	_____
12	37-39	1-28	_____	_____	_____	_____
Building Your Arithmetic Skills						
Chapter 2	Page 36	Problem 1-31	_____	_____	_____	_____
2	37	7-8	_____	_____	_____	_____
3	52	1-7	_____	_____	_____	_____
3	53	1-48	_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills							
Chapter 1	Page 6	Problem 1-8		_____	_____	_____	_____
1	7	1-8		_____	_____	_____	_____
2	32	3-5		_____	_____	_____	_____
3	52	1-6		_____	_____	_____	_____
Improving Your Navy Numerical Skills							
Topic Multiplication	Lesson 2	Page 25-27	Problem 1-20	_____	_____	_____	_____
Steps to Mathematics - Book 2							
Lesson 33	Page 33	Problem 1-6		_____	_____	_____	_____
35	35	1-7		_____	_____	_____	_____
37	37	1-7		_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skill Development Kit							
Color	Topic	Card	Problem				
Red	Multiplication	2	(Exercises)				
Red	Multiplication	3	(Exercises)				
Red	Multiplication	4	(Exercises)				
Red	Multiplication	5	(Exercises)				
Red	Multiplication	8	(Exercises)				
Red	Multiplication	9	(Exercises)				
Red	Multiplication	11	(Exercises)				

MULTIPLICATION OF WHOLE NUMBERS
Partial Product

ENABLING OBJECTIVE: Given multiplication problems with partial products, the student will be able to find the product of two factors, one not exceeding 25, with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skills Development Kit							
Color	Topic	Card	Problem				
Red	Multiplication	14a	(Exercises)				
Red	Multiplication	14b	(Exercises)				
Red	Multiplication	15a	(Exercises)				
Red	Multiplication	15b	(Exercises)				
Directing Arithmetic Skills							
Chapter	Page	Problem					
3	53	1-9					
Continuing Arithmetic Skills							
Chapter	Page	Problem					
2	53	1-6					
3	81	1-4					

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Building Arithmetic Skills							
Chapter	Page	Problem					
4	88	25-34					
4	95	1-2					
4	98	13-20					
Arithmetic Skills Workbook							
Unit	Page	Problem					
11	35-37	1-27					
12	37-39	1-25					
Improving Your Navy Numerical Skills							
Topic	Lesson	Page	Problem				
Multiplication	3	28-30	1-20				
Multiplication	4	31	1-20				

DIVISION OF WHOLE NUMBERS
Basic Facts

ENABLING OBJECTIVE: Given division problems, the student will be able to name the quotients when the divisors are less than 10 and the dividends are greater than 25 with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 1						
Unit 1	Page 24	Problem 1-29				
1	25	1-3				
1	27	1-8				
Continuing Arithmetic Skills						
Chapter 1	Page 9	Problem 1-12				
1	13	1-5				
1	14	1				
1	21	14-17				

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills (continued)							
Chapter 3	Page 54	Problem 1-7		_____	_____	_____	_____
3	55	10-11		_____	_____	_____	_____
3	58	6-8		_____	_____	_____	_____
Improving Your Navy Numerical Skills							
Topic Division	Lesson 2	Page 34-36	Problem 1-20	_____	_____	_____	_____

DIVISION OF WHOLE NUMBERS
One-Digit Divisor Without Internal Remainder

ENABLING OBJECTIVE: Given division problems with one-digit divisors and no internal remainders, the student will be able to divide whole numbers by 2, 3, or 4 with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills							
Chapter 3	Page 67	Problem 2-3		_____	_____	_____	_____
Basic Essentials of Mathematics - Part 1							
Book 1	Page 25	Problem 1-3		_____	_____	_____	_____
SRA Computational Skills Development Kit							
Color Red	Topic Division	Card 1	Problem (Exercises)	_____	_____	_____	_____
Red	Division	3	(Exercises)	_____	_____	_____	_____
Red	Division	4	(Exercises)	_____	_____	_____	_____
Red	Division	7	(Exercises)	_____	_____	_____	_____

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Building Arithmetic Skills						
Chapter	Page	Problem				
3	62	23-24	_____	_____	_____	_____
3	63	1-8	_____	_____	_____	_____
3	74	3-5	_____	_____	_____	_____
6	115	1-15	_____	_____	_____	_____
6	153	1-15	_____	_____	_____	_____

DIVISION OF WHOLE NUMBERS
One-Digit Divisor With Internal Remainder

ENABLING OBJECTIVE: Given division problems with internal remainders, the student will be able to divide whole numbers by 2, 3, or 4 with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit 14	Page 45-47	Problem 1-32	_____	_____	_____	_____
Mathematics and Your Career						
Chapter 1	Page 25	Problem 24,26,27	_____	_____	_____	_____
Continuing Arithmetic Skills						
Chapter 3	Page 62	Problem 7-8	_____	_____	_____	_____
3	69	4-5	_____	_____	_____	_____

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Math - Part 1						
Unit 1	Page 24	Problem 25-28	_____	_____	_____	_____
1	25	1-3	_____	_____	_____	_____
1	27	2-8	_____	_____	_____	_____

DIVISION OF WHOLE NUMBERS
Two-Digit Divisor

ENABLING OBJECTIVE: Given division problems with divisors in the tens, the student will be able to find the quotients with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Continuing Arithmetic Skills						
Chapter 8	Page 178	Problem 1,2,3	_____	_____	_____	_____
8	179	All	_____	_____	_____	_____
Mathematics and Your Career						
Chapter 1	Page 27	Problem 34-37	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 1						124
Unit 1	Page 29	Problem 1-3	_____	_____	_____	_____
1	31	2-5	_____	_____	_____	_____
1	32	15-16	_____	_____	_____	_____

123

80

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Module Series: Complete, Non-Programmed							
Module 1	Unit 7	Page 53-65	Problem (Exercises)				
SRA Computational Skills Development Kit							
Color Red	Topic Division	Card 9	Problem (Exercises)				
Red	Division	10	(Exercises)				
Red	Division	11	(Exercises)				
Red	Division	12	(Exercises)				
Red	Division	17	(Exercises)				
Red	Division	18	(Exercises)				
Red	Division	19	(Exercises)				
Red	Division	20	(Exercises)				
Red	Division	21	(Exercises)				
Red	Division	22	(Exercises)				
Red	Division	23	(Exercises)				
Red	Division	24	(Exercises)				
Red	Division	25	(Exercises)				
Red	Division	26	(Exercises)				
Red	Division	27	(Exercises)				

81

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for the High School Equivalency in Mathematics - Book 5							
Exercise 5	Page 14	Problem A,B					
Arithmetic Skills Workbook							
Unit 13	Page 43-44	Problem 13-30					
14	47	19-26					
Directing Arithmetic Skills							
Chapter 1	Page 17	Problem 2-3					
1	21	11-13					
2	55	11-33					
2	56	1-5					
Improving Your Navy Numerical Skills							
Topic Division	Lesson 3	Page 37-38	Problem 1-20				
Division	4	39-42	1-20				

FRACTIONS
Addition and Subraction

ENABLING OBJECTIVE: Given common fractions with like denominators, the student will be able to find the sums and differences of these fractions with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skills Developmental Kit							
Color: Blue	Topic: Addition	Card: 1	Problem: (Exercises)				
Blue	Addition	2	(Exercises)				
Blue	Addition	3	(Exercises)				
Blue	Addition	4	(Exercises)				
Blue	Addition	10	(Exercises)				
Blue	Subtraction	1	(Exercises)				
Blue	Subtraction	2	(Exercises)				
Arithmetic Skills Workbook							
Unit: 27	Page: 86-87		Problem: 1-16				

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Mathematics and Your Career				
Chapter 2, Page 59-60, Problem 23-26	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 1				
Unit 2, Page 35, Problem 1-7	_____	_____	_____	_____
Unit 2, Page 43, Problem 1-9	_____	_____	_____	_____
Arithmetic Module Series: Complete, Non-Programmed				
Module 2, Unit 3, Page 107-120, Problem (Exercises)	_____	_____	_____	_____

132

131

DECIMALS
Addition and Subtraction

ENABLING OBJECTIVE: Given problems to add and subtract decimals, the student will be able to find the sums and differences of decimals with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Mathematics and Your Career						
Chapter 4	Page 103	Problem 1-9	_____	_____	_____	_____
4	109	11-20	_____	_____	_____	_____
Arithmetic Skills Workbook						
Unit 45	Page 139-140	Problem 1-8	_____	_____	_____	_____
46	141-142	1-2	_____	_____	_____	_____
Programmed Math for Adults - Book 11						
Page 40	Problem (Exercise)		_____	_____	_____	_____
51	(Exercise)		_____	_____	_____	_____
54	(Exercise)		_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
SRA Computational Skills Development Kit							
Color	Topic	Card	Problem (Exercises)				
Gold	Addition	1					
Gold	Addition	2					
Gold	Addition	3					
Gold	Addition	4					
Gold	Addition	5					
Gold	Addition	6					
Gold	Addition	7					
Gold	Addition	8					
Gold	Subtraction	1					
Gold	Subtraction	2					
Gold	Subtraction	3					
Gold	Subtraction	4					
Gold	Subtraction	5					
Gold	Subtraction	6					
Gold	Subtraction	7					
Gold	Subtraction	8					
Gold	Subtraction	9					

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Steps to Mathematics - Book 2				
Lesson 19, Page 19, Problem 3-6				
Lesson 21, Page 21, Problem 1-6				
Lesson 28, Page 28, Problem 2-7				
Lesson 29, Page 29, Problem 4				
Lesson 31, Page 31, Problem 4-6				
Arithmetic Module Series: Complete, Non-Programmed				
Module 3, Unit 2, Page 181-189, Problem (Exercises)				
Improving Your Navy Numerical Skills				
Topic: Addition, Lesson 3, Page 11-12, Problem 1-20				
Subtraction, Lesson 3, Page 20-21, Problem 1-20				
Basic Pay, Lesson 2, Page 99-100, Problem C: 1-6				

DECIMALS
Multiplication

ENABLING OBJECTIVE: Given problems to multiply whole numbers and decimals, the student will be able to find the products expressed in tens and hundreds with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook							
Unit 47	Page 143-144	Problem 1-16		_____	_____	_____	_____
SRA Computational Skills Development Kit							
Color Gold	Topic Multiplication	Card 1a	Problem (Exercises)	_____	_____	_____	_____
Gold	Multiplication	1b	(Exercises)	_____	_____	_____	_____
Gold	Multiplication	3a	(Exercises)	_____	_____	_____	_____
Gold	Multiplication	3b	(Exercises)	_____	_____	_____	_____
Steps to Mathematics - Book 2							
Lesson 38	Page 38	Problem 1-8		_____	_____	_____	_____

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Directing Arithmetic Skills				
Chapter 2, Page 36, Problem 6-10				
Programmed Math for Adults - Book 11				
Page 56, Problem (Exercises)				
Page 64, (Exercises)				
Page 65, (Exercises)				
Page 82, (Exercises)				
Page 83, (Exercises)				
Basic Essentials of Mathematics - Part 1				
Unit 1, Page 19, Problem 2-8				
Unit 1, Page 20, Problem 3				
Mathematics and Your Career				
Chapter 4, Page 116, Problem 21-27				
Arithmetic Module Series: Complete, Non-Programmed				
Module 3, Unit 3, Page 190-200, Problem (Exercises)				

89

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5				
Exercise 13, Page 30, Problem A-D	_____	_____	_____	_____
Improving Your Navy Numerical Skills				
Topic Basic Pay, Lesson 3, Page 101-102, Problem B: 1-6	_____	_____	_____	_____

NUMBER SENTENCES
Multiplication and Division

ENABLING OBJECTIVE: Given simple multiplication and division number sentences, the student will be able to find missing factors with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 2				
Unit 3, Page 62, Problem 1-42	_____	_____	_____	_____
Preparation for High School Equivalency in Mathematics - Book 5				
Exercises 28, Page 61, Problem 1-18	_____	_____	_____	_____
Improving Your Navy Numerical Skills				
Topic: Measuring Temperature, Lesson 3, Page 85, Exercise C: 1-5	_____	_____	_____	_____

NUMBER SENTENCES
Parenthetical Sentences

ENABLING OBJECTIVE: Given number sentences involving parentheses, the student will be able to solve the sentences and find the correct factors with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5						
Exercise 24	Page 53	Problem A-C	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 2						
Unit 3	Page 69	Problem 21-30	_____	_____	_____	_____
3	70	7-11; 14	_____	_____	_____	_____

PROBLEM SOLVING
Solution Models

ENABLING OBJECTIVE: Given word problems involving one step or two steps, the student will be able to identify the appropriate number sentence to solve the problems with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit	Page	Problem				
3	13	1-5	_____	_____	_____	_____
4	16	1-5	_____	_____	_____	_____
5	18	1-5	_____	_____	_____	_____
6	22-23	1-5	_____	_____	_____	_____
7	25	1-5	_____	_____	_____	_____
8	28	1-5	_____	_____	_____	_____
Preparation for High School Equivalency in Mathematics - Book 5						
Exercise	Page	Problem				
2	9	A-B	_____	_____	_____	_____
3	10	A-B	_____	_____	_____	_____

93

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5 (continued)				
Exercise 4, Page 13, Problem A-B				
Exercise 5, Page 14, Problem A-B				
Steps To Mathematics - Book 5				
Lesson 16, Page 16, Problem 1-8				
Lesson 20, Page 20, Problem 1-6				
Lesson 27, Page 27, Problem 1-5				
Lesson 30, Page 30, Problem 1-6				
Lesson 36, Page 36, Problem 1-6				
Lesson 43, Page 43, Problem 1-8				
Improving Your Navy Numerical Skills				
Topic: Basic Pay, Lesson 2, Page 99-100, Exercise C: 1-6				
Basic Pay, Lesson 3, Page 101-102, Exercise C: 1-6				
Basic Pay, Lesson 4, Page 103-104, Exercise C: 1-5				
Budget Preparation, Lesson 2, Page 122, Exercise B: 1-6				

151

152

PROBLEM SOLVING
Two-Step Problems

ENABLING OBJECTIVE: Given two-step word problems, the student will be able to solve the problems with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Steps To Mathematics - Book 2						
Lesson 39	Page 39	Problem 1-8				
46	46	1-8				
48	48	1-8				
50	50	1-6				
57	57	1-6				
Arithmetic Skills Workbook						
Unit 84	Page 258-259	Problem 1-2				
85	261	1				
86	266	1-2				
87	266-269	1-2				

Material	Topic	Lesson	Page	Exercise	Date Assigned	Date Completed	Score	Instructor's Initials
Improving Your Navy Numerical Skills	Measuring Temperature	2	84	C: 1-5	_____	_____	_____	_____

PROBLEM SOLVING
Rate Problems

ENABLING OBJECTIVE: Given word problems involving ratios, the student will be able to solve rate problems involving time, time and distance, and money with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Skills Workbook						
Unit 40	Page 127	Problem 1-5				
Review	128	21-26				
Basic Essentials of Mathematics - Part 2						
Unit 4	Page 96	Problem 1-20				
Preparation for High School Equivalency in Mathematics - Book 5						
Exercise 41	Page 86	Problem A-B				

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Arithmetic Module Series: Complete, Non-Programmed				
Module 4 Unit 6 Page 289-304 Problem (Exercises)	_____	_____	_____	_____
Improving Your Navy Numerical Skills				
Topic Military Time Lesson 1 Page 51-53 Problem C: 1,2,4	_____	_____	_____	_____

PROBLEM SOLVING
Missing Data

ENABLING OBJECTIVE: Given word problems with missing data, the student will be able to identify the additional information needed to solve the problems with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material		Date Assigned	Date Completed	Score	Instructor's Initials
Prescription 3.14: Problem Solving - Missing Data					
Worksheet 1	Problem 1-7	_____	_____	_____	_____
2	1-7	_____	_____	_____	_____
3	1-4	_____	_____	_____	_____
4	1-3	_____	_____	_____	_____

READING AND INTERPRETING TABLES AND GRAPHS
Reading and Interpreting Tables

ENABLING OBJECTIVE: Given tables containing rows and columns of data, the student will be able to read and use the data in the tables with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 2				
Unit 2, Page 56, Problem 1-10	_____	_____	_____	_____
Programmed Math for Adults - Book 11				
Page 70, Problem (Exercises)	_____	_____	_____	_____
Page 75, Problem (Exercises)	_____	_____	_____	_____
Page 76, Problem (Exercises)	_____	_____	_____	_____
Page 77, Problem (Exercises)	_____	_____	_____	_____

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Improving Your Navy Numerical Skills							
Topic	Lesson	Page	Problem				
Flooding Rates	1	80	1-10	_____	_____	_____	_____
Flooding Rates	2	81	B: 1-6	_____	_____	_____	_____
Basic Pay	1	98	1-10	_____	_____	_____	_____

READING AND INTERPRETING AND TABLES AND GRAPHS
Reading and Interpreting Graphs

ENABLING OBJECTIVE: Given graphs using columns and bars, the student will be able to read and use the data in the graphs with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 2						
Unit 2	Page 57	Problem 1-10				
2	58	1-6				
2	59	1-11				
Arithmetic Skills Workbook						
Unit 102	Page 315-317	Problem 1-5				
103	317-319	1-4				
104	319-321	1-3				
105	321-323	1				
106	323-325	1				

Material

Date Assigned

Date Completed

Score

Instructor's Initials

Building Arithmetic Skills

Chapter	Page	Problem
5	103	graph
5	104	graph
5	105	graph
5	106	graph
5	107	graph
5	108	graph
5	109	graph
5	110	entire page
5	112	graph
5	113	graph
5	114	graph
5	115	graph
5	116	graph
5	117	graph

103

GEOMETRY AND MEASUREMENT
Geometric Shapes and Properties

ENABLING OBJECTIVE: Given geometric figures, the student will be able to identify specified figures and to recognize geometric properties with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Preparation for High School Equivalency in Mathematics - Book 5						
Exercise 44	Page 93	Problem 1-8				
45	94	A-C				
46	97	A-B, 1-2				
47	98	1-5				
Building Arithmetic Skills						
Chapter 8	Page 178	Problem (Exercise)				
8	183	(Exercise)				

Material			Date Assigned	Date Completed	Score	Instructor's Initials
Directing Arithmetic Skills						
Chapter 8	Page 176	Problem (all)				
8	178	(top of page)				
8	180	(top of page)				
8	181	(top of page)				
8	183	(top of page)				
Basic Essentials of Mathematics - Part 2						
Unit 2	Page 47	Problem 1-10				
2	48	1-8				
2	49	1-10				
2	50	1-9				
2	51	1-10				
2	52	1-7				
2	53	1-6				

GEOMETRY AND MEASUREMENT
Time Measurement

ENABLING OBJECTIVE: Given problems involving units of time, the student will be able to solve problems involving hours, days, and weeks with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Building Arithmetic Skills				
Chapter 3, Page 57, Problem (Exercises)				
Acquiring Arithmetic Skills				
Chapter 2, Page 40, Problem 1-2				
Arithmetic Skills Workbook				
Unit 74, Page 221-223, Problem 1-20				176
Steps to Mathematics - Book 2				
Lesson 53, Page 53, Problem 1-7				
54, 54, 1-8				

175

Material				Date Assigned	Date Completed	Score	Instructor's Initials
Basic Essentials of Mathematics - Part 2							
Unit 2	Page 28	Problem 1-3		_____	_____	_____	_____
2	30	1-4		_____	_____	_____	_____
2	32	2-4		_____	_____	_____	_____
2	35	1-4; 19; 22		_____	_____	_____	_____
2	36	1,2,7,8,9,16		_____	_____	_____	_____
Improving Your Navy Numerical Skills							
Topic	Lesson	Page	Problem				
Military Time	1	47	1-15	_____	_____	_____	_____
Military Time	2	50	1-10	_____	_____	_____	_____

GEOMETRY AND MEASUREMENT
English Units of Measurement

ENABLING OBJECTIVE: Given problems involving English units of measurement, the student will be able to estimate units and convert from one unit of measurement to another with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Mathematics and Your Career				
Chapter 6, Page 170, Problem 1-12	_____	_____	_____	_____
Arithmetic Skills Workbook				
Unit 66, Page 193-196, Problem 1-30	_____	_____	_____	_____
Steps to Mathematics - Book 2				
Lesson 49, Problem 1-6	_____	_____	_____	_____
50, 1-6	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 2				
Unit 2, Page 27, Problem 1-2,5,8,13-15	_____	_____	_____	_____

GEOMETRY AND MEASUREMENT
Metric Units of Measurement

ENABLING OBJECTIVE: Given problems involving metric units of measurement, the student will be able to name the appropriate metric units used in different situations and relate the meter to other linear metric units with an accuracy of at least 80 percent.

INSTRUCTIONS: Complete all of the activities listed below that have a date written in the space under "Date Assigned." The activities must be done in the order assigned by your instructor. If no order is assigned, you may do the activities in any order you choose.

The activities require only pencil and paper except where noted. Answers to the activity items should be recorded on worksheets in your notebook. Your instructor will give directions for scoring and recording results on each activity. See your instructor if you have any questions about your work.

Material	Date Assigned	Date Completed	Score	Instructor's Initials
Mathematics and Your Career				
Chapter 7, Page 183-187, Problem 1-20	_____	_____	_____	_____
Arithmetic Skills Workbook				
Unit 78, Page 235-239, Problem 1-30	_____	_____	_____	_____
Basic Essentials of Mathematics - Part 2				
Unit 2, Page 27, Problem 3,6,7,11,12,16	_____	_____	_____	_____
Unit 2, Page 28, Problem 11,20	_____	_____	_____	_____
Unit 2, Page 29, Problem 3,10,17	_____	_____	_____	_____
Unit 2, Page 31, Problem 6,11	_____	_____	_____	_____
Unit 2, Page 32, Problem 11,22	_____	_____	_____	_____

APPENDIX A

MATHEMATICAL SKILLS CURRICULUM
WORKSHEETS FOR PROBLEM SOLVING-MISSING DATA
(Prescription 3.14)

PRESCRIPTION 3.14
PROBLEM SOLVING - MISSING DATA

Worksheet 1

1. Tom paid 9¢ for a pen. What other information will you need to figure out whether or not he received any change?

   a. Whether or not the pen was on sale

   b. When he bought the pen

   c. How much money Tom handed the salesperson

   d. The cost of three pens

   e. The color of the pen

2. It takes Angela 4 hours to travel to her grandmother's house. What other information will you need to find out if she arrived by 6 P.M.?

   a. Whether she drove or took a bus

   b. Whether she traveled alone

   c. Where her grandmother lives

   d. How old Angela is

   e. What time she left

3. Mary cashed her weekly paycheck on Friday. Her paycheck was for $150. What other information do you need to know if you want to find out how many hours Mary worked this week?

   a. Where Mary is employed

   b. How old Mary is

   c. How much Mary is paid per hour

   d. What kind of work Mary does

   e. How much Mary spends for lunch

4. James walked home from work in 20 minutes. What other information will you need to know if you want to find out how far James lives from work?

   a. What time James got home

   b. How old James is

   c. What James does for a living

   d. How long James has worked in the same place

   e. How far James walks in one minute

Worksheet 1 (continued)

5. Sam finished the first half of his math homework problems. If you assume that Sam spends the same amount of time on each math problem, what will you need to know to find out how much time it will take him to finish his math homework?

   a. If Sam likes math

   b. How many pages the math book contains

   c. How many problems Sam had to complete

   d. How long it took to finish the first half of the homework problems

   e. What grade Sam is in

6. Mary is seven years older than Fred. What information will you need to know if you want to find out how old Fred is?

   a. Mary's birthdate

   b. Fred's birthdate

   c. What year it is

   d. Whether Fred and Mary know each other

   e. Mary's age

7. Ann has to read five books for her English class. If you assume that Ann spends the same amount of time on each book, what other information will you need if you want to know how long it will take Ann to finish her English assignment?

   a. How long each book is

   b. What the books are about

   c. Whether or not Ann likes to read

   d. What other subjects Ann is taking

   e. How long it takes Ann to read one book

PRESCRIPTION 3.14
PROBLEM SOLVING - MISSING DATA

Worksheet 2

In each of the following problems, you would need more information if you wanted to solve the problem. Read each problem carefully, then write the information you would need to solve the problem.

EXAMPLE: Jim wants to go to the movies tonight. Will he be able to afford the movie if he has $5. Would need to know how much the movie costs.

1. James had $27 in his bank account. He bought groceries and paid for them by check. How much money did he have left in the bank?

_____

2. Ed wants to save money to buy a car. How much money will Ed need to save each month if he wants to pay for the car in 2 years?

_____

3. Lisa is taking a course in auto mechanics. She will earn twice as much money when she graduates as she earns now. How much money will Lisa earn when she graduates?

_____

4. Tom is a playground supervisor. There were three times as many children on the playground Saturday as there were Friday. How many children were on the playground Saturday?

_____

5. George wants to take Monday afternoon off from his job. His boss told him that he would lose one-half day's pay if he took off. How much money would George lose?

_____

6. Frank wrote checks for $37.50, $18.00, and $3.50. How much did Frank have left in his bank account?

_____

7. George wants to save some money each month from his paycheck. He spends $150 on rent each month and $150 on other expenses. How much will he have left for savings after he pays his rent and other expenses each month?

_____

PRESCRIPTION 3.14
PROBLEM SOLVING - MISSING DATA

Worksheet 3

Look at the written problems in the section below. Some of the problems contain all the information you would need if you wanted to solve them. Some of the problems, however, need additional information. Read each problem carefully. If the problem can be solved as it is written, leave the line under the problem blank. If the problem cannot be solved as it is written, use the line under the problem to tell what other information would be needed to solve the problem.

EXAMPLE: Andy made a bank deposit in his account for $150. What is the total amount Andy has in the bank now?
Would need to know how much was in the bank before the deposit was made

1. Fred wants to buy a pair of boots that cost $75. He can save some money to pay for them. Will Fred be able to pay for the boots from his savings for three months?

_____

2. Joyce makes $500 every two weeks. She wants to move into a new apartment that rents for $350 per month. Will Joyce be able to afford the new apartment?

_____

3. Mr. Allen owns a flower shop. Last month he sold 500 roses and twice as many carnations as he sold the month before. What is the total number of flowers Mr. Allen sold last month?

_____

4. Ann is a house painter. The first month she was in business, she painted 5 houses. The next month, she painted twice as many houses as the month before. In the third month, she painted 12 houses. What is the total number of houses Ann painted in the period of three months?

_____

PRESCRIPTION 3.14
PROBLEM SOLVING - MISSING DATA

Worksheet 4

Read the following problems carefully. After you read each one, read the items under the problem and mark an X on the item that would not be needed to solve the problem.

1. Alice is thinking of buying a new car this month. She wants to make sure that she can afford to make the car payments and take care of the car properly. What information would not help Alice make her decision?

   a. Price of the car

   b. Alice's current monthly salary

   c. The price of gas and oil

   d. The car's mpg (miles per gallon)

   e. Alice's salary last year

2. Jim wants to make extra money by selling some paintings that he did. What information will not be helpful to Jim when he figures out how much money he can earn?

   a. The number of paintings he has to sell

   b. The price he wants for each painting

   c. His expenses for doing each painting

   d. His house payment

   e. The fee he would pay to a seller

3. Paul want to trade in his old car for a newer model. What information will not be helpful to Paul when he considers whether or not he can afford to buy the new car.

   a. Trade in value of his old car

   b. The price of the new car

   c. The old car's mpg (miles per gallon)

   d. The new car's mpg (miles per gallon)

   e. The style of the new car

APPENDIX B

MATHEMATICAL SKILLS CURRICULUM CRITERION TESTS

CRITERION TEST 1.1

WHOLE NUMBERS AND DECIMAL PLACE VALUE

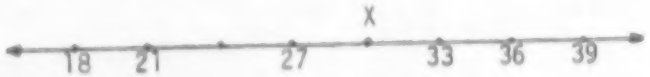
Directions: Read each question carefully. Choose the best answer for each question. Record your answer in the appropriate space on the answer sheet.

EXAMPLE:

What number is 3 less than 10?
a. 13 b. 8 c. 7 d. 9

a	b	c	d
0	0	●	0

1. What number goes at point X on the number line?



a. 24 b. 29 c. 30 d. 31

2. What number goes in the empty box?

48	44	40	36		28	24

a. 34 b. 27 c. 33 d. 32

3. What is the numeral for five thousand, eighty?

a. 580

b. 5080

c. 50080

d. 500080

4. What is the numeral for two million, fifteen thousand, thirty?

a. 2,000,150,030

b. 2,000,015,030

c. 2,015,300

d. 2,015,030

5. What is the numeral for:

   3,000 + 60 + 7?

   a. 3067

   b. 30067

   c. 3607

   d. 30607

6. What is another way of writing 4600?

   a. 4000 + 60

   b. 4000 + 600

   c. 400 + 6000

   d. 4 + 600

7. What is the numeral for:

   (6 x 1000) + (4 x 100) + (7 x 1)?

   a. 60,004,007

   b. 6,000,407

   c. 6470

   d. 6407

8. Which numeral has the digit in the tens place that shows the greatest number of tens?

   a. 9562

   b. 7634

   c. 5483

   d. 2527

9. If the 6 in 76310 is changed to an 8, then 76310 is increased by:

   a. 2000

   b. 200

   c. 20

   d. 2

10. In the subtraction problem, what digit goes in the ☐ ?

$$\begin{array}{r} 823 \\ -168 \\ \hline 6\square 5 \end{array}$$

a. 6 b. 5 c. 8 d. 7

11. In the multiplication problem, what digit goes in the ☐ ?

$$\begin{array}{r} 68 \\ \times\ \ 4 \\ \hline 2\square 2 \end{array}$$

a. 3 b. 4 c. 6 d. 7

12. Which number is the largest?

   a. 07917

   b. 07197

   c. 00989

   d. 07791

13. How many odd numbers are between 14 and 24?

   a. 10 b. 6 c. 5 d. 4

14. The number 840 rounded to the nearest hundred is:

   a. 900 b. 800 c. 850 d. 400

15. How many digits does the product have for 4 x 272?

a. 2

b. 5

c. 3

d. 4

CRITERION TEST 1.2

RATIONAL NUMBERS AND NUMERATION

Directions: Read each question carefully. Choose the best answer for each question. Record your answer in the appropriate space on the answer sheet.

EXAMPLE:

The $\square$ stands for which number?

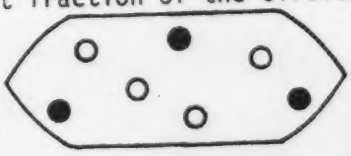
$\frac{6}{3} = \square$ a. 2 b. 3 c. 1 d. 0

a	b	c	d
●	0	0	0

1. What fraction of the sectors in the figure is darkened?

a. $\frac{1}{3}$ b. $\frac{3}{8}$ c. $\frac{8}{3}$ d. $\frac{3}{5}$

2. What fraction of the circles in the figure is darkened?



a. $\frac{7}{3}$ b. $\frac{2}{5}$ c. $\frac{1}{2}$ d. $\frac{3}{7}$

3. What number goes in the $\square$?

$\frac{5}{5} = \square$

a. 25 b. 10 c. 1 d. 0

4. Which fraction names the largest number?

a. $\frac{1}{4}$ b. $\frac{1}{5}$ c. $\frac{1}{8}$ d. $\frac{1}{9}$

5. Which fraction names the smallest number?

   a. $\frac{5}{8}$ b. $\frac{2}{5}$ c. $\frac{1}{2}$ d. $\frac{4}{7}$

6. What is the simplest form for $\frac{18}{36}$?

   a. $\frac{2}{9}$ b. $\frac{2}{3}$ c. $\frac{3}{4}$ d. $\frac{1}{2}$

7. What is the simplest form for $\frac{9}{12}$?

   a. $\frac{1}{2}$ b. $\frac{2}{3}$ c. $\frac{3}{4}$ d. $\frac{5}{6}$

8. Which decimal names the largest number?

   a. 0.25

   b. 0.205

   c. 0.025

   d. 0.0205

9. Which decimal names the smallest number?

   a. 0.024

   b. 0.0024

   c. 0.24

   d. 0.042

10. What fraction is the same as 0.25?

   a. $\frac{1}{25}$

   b. $\frac{25}{250}$

   c. $\frac{1}{100}$

   d. $\frac{25}{100}$

CRITERION TEST 1.3

OPERATIONS AND PROPERTIES

Directions: Read each question carefully. Choose the best answer for each question. Record your answer in the appropriate space on the answer sheet.

EXAMPLE:

The $\square$ stands for what number?

$\frac{12}{\square} = 4$ a. 6 b. 5 c. 3 d. 2

a	b	c	d
0	0	●	0

1. Which pair of numbers names two factors of 18?

   a. (2, 12)

   b. (3, 7)

   c. (8, 10)

   d. (6, 9)

2. Which pair of numbers names two factors of 24?

   a. (3, 9)

   b. (10, 14)

   c. (6, 12)

   d. (8, 16)

3. Which numbers are a set of factors of 36?

   a. { 6, 9, 18 }

   b. { 8, 12, 16 }

   c. { 9, 10, 12 }

   d. { 8, 9, 18 }

4. Which numbers are a set of factors of 56?

   a. { 4, 12, 14 }

   b. { 7, 9, 14 }

   c. { 7, 8, 28 }

   d. { 3, 8, 22 }

5. Another way to write 3 x 74 is:

   a. (3 x 7) + (3 x 4)

   b. (3 x 70) + (3 x 4)

   c. (3 x 7) + (3 x 40)

   d. (3 x 70) + 7

6. In the subtraction problem, what number goes in the ☐ ?

$$\begin{array}{r} \square\,\square\,\square \\ -\,4\;4\;6 \\ \hline 3\;2\;9 \end{array}$$

   a. 117

   b. 127

   c. 765

   d. 775

7. In the subtraction problem, what number goes in the ☐ ?

$$\begin{array}{r} \square\,\square\,\square \\ -\,5\;2\;7 \\ \hline 2\;1\;8 \end{array}$$

   a. 635

   b. 745

   c. 319

   d. 309

8. What number goes in the □ ?

   6 x (3 + 4) = (6 x□) + (6 x 4)

   a. 3

   b. 4

   c. 7

   d. 18

9. What number goes in the □ ?

   5 x (7 + 8) = (5 x 7) + (5 x□)

   a. 40

   b. 15

   c. 8

   d. 7

10. Which number sentence has a relation to:

    144 ÷ 16 = □

    a. □ x 16 = 144

    b. 16 ÷ 144 = □

    c. 144 x□ = 16

    d. □ ÷ 144 = 16

CRITERION TEST 2.1

ADDITION OF WHOLE NUMBERS

Directions: Read each question carefully. Choose the best answer for each question. Record your answer in the appropriate space on the answer sheet.

EXAMPLE:

$$\begin{array}{r} 16 \\ +\ 8 \\ \hline \end{array}$$

a. 96 b. 23 c. 25 d. 24

a	b	c	d
0	0	0	●

1. $\begin{array}{r} 313 \\ +101 \\ \hline \end{array}$

a. 414 b. 404 c. 424 d. 212

2. $\begin{array}{r} 615 \\ +315 \\ \hline \end{array}$

a. 300 b. 820 c. 930 d. 966

3. $\begin{array}{r} 453 \\ +264 \\ \hline \end{array}$

a. 6117 b. 189 c. 617 d. 717

4. $\begin{array}{r} 327 \\ +536 \\ \hline \end{array}$

a. 863 b. 853 c. 209 d. 8513

5. $\begin{array}{r} 572 \\ +243 \\ \hline \end{array}$

a. 7115 b. 815 c. 805 d. 329

6. $\begin{array}{r} 823 \\ +746 \\ \hline \end{array}$

a. 77 b. 1669 c. 1596 d. 1569

7. 7543
+1456

a. 6087 b. 6898 c. 8999 d. 9999

8. 6639
+1245

a. 7874 b. 7884 c. 5394 d. 78,814

9. 5734
+3457

a. 9191 b. 9119 c. 8191 d. 2277

10. 7695
+8537

a. 15,132 b. 15,232 c. 16,132 d. 16,232

CRITERION TEST 2.2

SUBTRACTION OF WHOLE NUMBERS

Directions: Read each question carefully. Choose the best answer for each question. Record your answer in the appropriate space on the answer sheet.

EXAMPLE:

$$\begin{array}{r} 14 \\ -\ 7 \\ \hline \end{array}$$

a. 6 b. 8 c. 7 d. 9

a	b	c	d
0	0	●	0

1. $\begin{array}{r} 118 \\ -\ 23 \\ \hline \end{array}$

a. 131 b. 105 c. 95 d. 85

2. $\begin{array}{r} 374 \\ -\ 57 \\ \hline \end{array}$

a. 217 b. 317 c. 327 d. 431

3. $\begin{array}{r} 657 \\ -364 \\ \hline \end{array}$

a. 293 b. 313 c. 393 d. 1021

4. $\begin{array}{r} 764 \\ -248 \\ \hline \end{array}$

a. 1012 b. 916 c. 526 d. 516

5. $\begin{array}{r} 1437 \\ -\ 829 \\ \hline \end{array}$

a. 2266 b. 618 c. 608 d. 518

6. $\begin{array}{r} 1267 \\ -\ 789 \\ \hline \end{array}$

a. 588 b. 478 c. 587 d. 2056

7. 1608
   - 765

   a. 843 b. 943 c. 934 d. 2373

8. 1804
   - 637

   a. 2441 b. 1277 c. 1167 d. 1177

9. 5060
   -4327

   a. 9387 b. 1743 c. 1733 d. 733

10. 6403
    -2566

    a. 4837 b. 3837 c. 3947 d. 4937

CRITERION TEST 2.3

MULTIPLICATION WHOLE NUMBERS

Directions: Please read each question carefully. Choose the best answer and mark the appropriate space on the answer sheet.

EXAMPLE:

$$\begin{array}{r} 9 \\ \times 9 \\ \hline \end{array}$$

a. 16 b. 81 c. 18 d. 61

a	b	c	d
0	●	0	0

1. 6 x 7 =

a. 24 b. 42 c. 48 d. 56

2. 9 x 6 =

a. 63 b. 56 c. 54 d. 45

3. 8 x 4 =

a. 48 b. 12 c. 24 d. 32

4. 5 x 8 =

a. 13 b. 85 c. 58 d. 40

5. $\begin{array}{r} 67 \\ \times\ 8 \\ \hline \end{array}$

a. 536 b. 546 c. 656 d. 563

6. $\begin{array}{r} 34 \\ \times\ 8 \\ \hline \end{array}$

a. 332 b. 272 c. 262 d. 227

7. $\begin{array}{r} 314 \\ \times\ 4 \\ \hline \end{array}$

a. 1256 b. 1246 c. 1248 d. 1346

8. 638
x 6

a. 3628 b. 3788 c. 3828 d. 3888

9. 37
x21

a. 111 b. 677 c. 767 d. 777

10. 41
x25

a. 425 b. 1025 c. 825 d. 1225

11. 53
x22

a. 212 b. 1066 c. 1166 d. 1616

12. 306
x 12

a. 3672 b. 3662 c. 3362 d. 918

13. 237
x202

a. 948 b. 46,864 c. 47,874 d. 4214

14. 206
x103

a. 824 b. 2678 c. 21,208 d. 21,218

15. 340
x320

a. 108,800 b. 98,800 c. 17,000 d. 10,880

CRITERION TEST 2.4

DIVISION OF WHOLE NUMBERS

Directions: Read each question carefully. Choose the best answer and mark your answer in the appropriate space on the answer sheet.

EXAMPLE:

49 ÷ 7 =

a. 8 b. 7 c. 9 d. 6

a	b	c	d
0	●	0	0

1. 36 ÷ 6 =

a. 5 b. 8 c. 7 d. 6

2. 56 ÷ 8 =

a. 6 b. 7 c. 8 d. 9

3. 63 ÷ 7 =

a. 7 b. 8 c. 9 d. 6

4. 48 ÷ 6 =

a. 8 b. 7 c. 6 d. 9

5. $3\overline{)696}$

a. 202 b. 232 c. 236 d. 2122

6. $4\overline{)484}$

a. 1111 b. 124 c. 111 d. 121

7. $2\overline{)618}$

a. 309 b. 319 c. 390 d. 39

8. $3\overline{)1536}$

a. 5120 b. 1412 c. 512 d. 502

For question 9 - 15, R stands for Remainder.

9. $3\overline{)378}$

a. 1260 b. 126 c. 122 R2 d. 120 R2

10. $5\overline{)502}$

a. 10 b. 100 c. 10 R2 d. 100 R2

11. $4\overline{)860}$

a. 205 b. 215 c. 21 R5 d. 215 R2

12. $2\overline{)504}$

a. 252 b. 202 c. 252 R1 d. 22 R1

13. $23\overline{)736}$

a. 32 R4 b. 23 R4 c. 32 d. 320

14. $26\overline{)650}$

a. 25 R13 b. 52 R13 c. 250 d. 25

15. $14\overline{)588}$

a. 42 b. 420 c. 42 R2 d. 24 R2

CRITERION TEST 2.5

FRACTIONS

Directions: Read each question carefully. Choose the best answer and mark the appropriate space on the answer sheet.

EXAMPLE:

$\frac{1}{5} + \frac{1}{5} =$

a. $\frac{2}{10}$ b. $\frac{2}{5}$ c. $\frac{1}{25}$ d. $\frac{1}{10}$

a	b	c	d
0	●	0	0

1. $\frac{2}{7} + \frac{2}{7} =$

a. $\frac{4}{14}$ b. $\frac{2}{14}$ c. $\frac{4}{49}$ d. $\frac{4}{7}$

2. $\frac{1}{3} + \frac{1}{3} =$

a. $\frac{1}{6}$ b. $\frac{2}{3}$ c. $\frac{1}{9}$ d. 1

3. $\frac{3}{7} + \frac{3}{7} =$

a. $\frac{9}{49}$ b. $\frac{6}{14}$ c. $\frac{6}{7}$ d. $\frac{3}{14}$

4. $\frac{2}{4} + \frac{1}{4} =$

a. $\frac{2}{8}$ b. $\frac{3}{8}$ c. $\frac{2}{16}$ d. $\frac{3}{4}$

5. $\frac{3}{6} + \frac{1}{6} =$

a. $\frac{2}{3}$ b. $\frac{4}{12}$ c. $\frac{3}{36}$ d. $\frac{2}{6}$

6. $\frac{4}{9} + \frac{2}{9} =$

a. $\frac{8}{81}$ b. $\frac{6}{18}$ c. $\frac{2}{3}$ d. $\frac{2}{9}$

7. $\frac{3}{5} - \frac{1}{5} =$

a. $\frac{4}{5}$ b. $\frac{2}{5}$ c. $\frac{8}{6}$ d. $\frac{2}{10}$

8. $\frac{4}{7} - \frac{1}{7} =$

a. $\frac{11}{8}$ b. $\frac{3}{14}$ c. $\frac{3}{7}$ d. $\frac{5}{7}$

9. $\frac{5}{6} - \frac{1}{6} =$

a. $\frac{2}{3}$ b. $\frac{11}{7}$ c. 1 d. $\frac{4}{12}$

10. $\frac{3}{8} - \frac{1}{8} =$

a. $\frac{11}{9}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. $\frac{2}{16}$

CRITERION TEST 2.6

DECIMALS

Directions: Read each question carefully. Choose the best answer and mark the appropriate space on your answer sheet.

EXAMPLE:

$5.00
+1.75

a b c d
● 0 0 0

a. $6.75 b. $67.50 c. $3.25 d. $.0675

1. $3.45 + $0.50 =

a. $3.95 b. $3.55 c. $3.50 d. $2.95

2. $2.65 + $0.70

a. $2.35 b. $2.72 c. $3.25 d. $3.35

3. $5.00 - $1.85 =

a. $4.85 b. $3.15 c. $3.85 d. $4.15

4. $10.00 - $3.75 =

a. $6.75 b. $7.75 c. $6.25 d. $7.25

5. 2.55 + 0.25 =

a. 5.05 b. 2.575 c. 2.5525 d. 2.80

6. 3.25 + 0.50 =

a. 2.75 b. 3.255 c. 3.75 d. 8.25

7. 4 x 2.2 =

a. 8.8 b. 0.088 c. 0.88 d. 88

8. 3 x 12.2 =

a. 366 b. 36.6 c. 3.66 d. 0.366

9. 4 x 0.15 =

a. 0.60 b. 0.060 c. 6.0 d. 60

10. 3 x 0.30 =

a. 90 b. 9 c. 0.09 d. 0.90

CRITERION TEST 2.7

NUMBER SENTENCES

Directions: Read the question carefully. Find the answer that makes the statement true. Mark the appropriate space on your answer sheet.

EXAMPLE:

$\square \times 5 = 15$

a. 2 b. 3 c. 5 d. 10

a	b	c	d
0	●	0	0

1. $\square \times 6 = 24$

a. $\frac{6}{24}$ b. 4 c. 30 d. 144

2. $\square \times 4 = 20$

a. 5 b. 24 c. 80 d. $\frac{4}{20}$

3. $18 \div \square = 3$

a. $\frac{3}{18}$ b. 21 c. 54 d. 6

4. $12 \div \square = 4$

a. $\frac{4}{12}$ b. 3 c. 16 d. 48

5. $\square \div 9 = 3$

a. 12 b. $\frac{3}{9}$ c. 27 d. 3

6. $\square \div 5 = 3$

a. $\frac{3}{5}$ b. 5 c. 8 d. 15

7. $(6 + 3) - (4 + 1) = \square$

a. 4 b. 5 c. 9 d. 14

8. $10 - (3 \times 2) = \square$

a. 16 b. 15 c. 5 d. 4

9. $18 - (2 \times 3) = \square$

a. 24 b. 23 c. 12 d. 11

10. $5 \times (2 + 4) = \square$

a. 30 b. 14 c. 13 d. 11

CRITERION TEST 3.1

PROBLEM SOLVING

Directions: Read each question carefully. Choose the best answer and mark the appropriate choice on the answer sheet.

EXAMPLE:

Joe bought 5 gallons of gasoline on Monday and 6 gallons on Wednesday. How many gallons of gasoline did he buy on the two days?

a. 10 b. 11 c. 12 d. 8

a	b	c	d
0	●	0	0

1. Jeff had $4 in money. He mowed a yard to earn $8 more. Which number sentence would you use to find out how many dollars he had in all?

   a. $12 - ☐ = $4

   b. $4 + ☐ = $8

   c. $4 + $8 = ☐

   d. $12 - $4 = ☐

2. Vera rode her bicycle 5 miles in the morning and 7 miles in the afternoon. Which number sentence would you use to find the number of miles that she rode in the morning and afternoon?

   a. 12 - ☐ = 5

   b. 5 + 7 = ☐

   c. 12 - ☐ = 7

   d. 5 + ☐ = 7

3. James has a grocery store game card with 4 columns for stamps. Each column has places for 6 stamps. Which number sentence would you use to show the number of stamps needed to fill the card?

   a. 6 + 4 = ☐

   b. 6 - 4 = ☐

   c. 6 ÷ 4 = ☐

   d. 4 x 6 = ☐

4. A club forms teams to play two kinds of games. One game has 4 teams with 4 members on each team. The other game has 2 teams with 5 members on each team. Which number sentence would you use to find the number of members on all teams?

   a. $(4 + 4) + (2 + 5) = \square$

   b. $(4 \times 4) + (2 \times 5) = \square$

   c. $(4 \times 5) + (4 \times 2) = \square$

   d. $(4 + 5) \times (4 + 2) = \square$

5. Mary buys a bag of candy that costs 39¢. She pays for it with 5 dimes. How much change should she receive?

   a. 11¢

   b. 21¢

   c. 34¢

   d. 89¢

6. Bill pays for a coloring pencil that costs 57¢. If he pays for it with 3 quarters, how much change should he receive?

   a. 8¢

   b. 43¢

   c. 54¢

   d. 18¢

7. Jean jogs 3 miles each day for 5 days during the week. She jogs 6 miles on one day during the weekend. How many miles does she jog during the six days?

   a. 21 miles

   b. 18 miles

   c. 33 miles

   d. 14 miles

8. One brand of soap cost 32 cents a bar. Another brand costs 28 cents a bar. Jim buys 4 bars of the cheaper brand of soap. How much did he save?

   a. 61¢

   b. 16¢

   c. 8¢

   d. 4¢

9. It takes 3 people working 9 hours to pick up the trash from a stadium parking lot. How long would it take one person to do the job working at the same pace?

   a. 3 hours

   b. 9 hours

   c. 12 hours

   d. 27 hours

10. Paul can drive 5 miles in 6 minutes. At the same speed, how many miles miles can he drive in 18 minutes?

    a. 18 miles

    b. 90 miles

    c. 15 miles

    d. 10 miles

11. A 6-ounce glass of milk costs 30¢. At the same cost per ounce, how much would you pay for 12 ounces?

    a. 60¢

    b. $1.20

    c. 72¢

    d. $3.60

12. It takes Carlene 2 hours to drive to the beach. What else do you have to know to figure out if she arrives by 11:00 a.m.?

    a. The number of miles to the beach

    b. The speed that she drove

    c. The kind of car she was driving

    d. The time when she left

13. Bob earned $20.00 for painting the walls in a room. What else do you have to know to figure out his hourly rate of pay?

    a. How large the room was

    b. How many hours he worked

    c. How much paint he used

    d. How the paint was applied

14. Sarah has worked 15 problems on her math homework assignment. What else do you have to know to figure out how many problems are left to be worked?

    a. How long it took to work the problems

    b. The kind of problems in the assignment

    c. The number of problems in the assignment

    d. How hard the problems are to work

15. You pay for 5 gallons of gasoline that you buy for your car. What else do you have to know to figure out how much you paid for each gallon of gasoline?

    a. The total cost of the gasoline purchase

    b. The kind of car

    c. The car's fuel efficiency rating

    d. The capacity of the car's gas tank

CRITERION TEST 3.2

READING AND INTERPRETING TABLES AND GRAPHS

Directions: Read each question carefully. Choose the best answer and mark the appropriate choice on your answer sheet.

Six teenagers were working to earn money for their vacations. The table below shows how much money they earned during a period of four weeks. Use the table to answer questions 1-4.

Amount Earned During Four Weeks

	1st Week	2nd Week	3rd Week	4th Week
Jeff	$44.00	$42.00	$54.00	$45.00
Christy	$20.00	$22.00	$24.00	$23.00
Carole	$12.00	$23.00	$13.00	$18.00
Cathy	$28.00	$25.00	$25.00	$20.00
Steve	$42.00	$42.00	$30.00	$18.00
Billy	$27.00	$29.00	$40.00	$45.00

1. Who earned the smallest amount of money during the 3rd week?

   a. Jeff b. Billy c. Cathy d. Carole

2. During which week did Christy earn $5.00 more than Steve?

   a. 2nd b. 4th c. 1st d. 3rd

3. How much more did Jeff earn the 3rd week than the 1st week?

   a. $10.00 b. $12.00 c. $9.00 d. $3.00

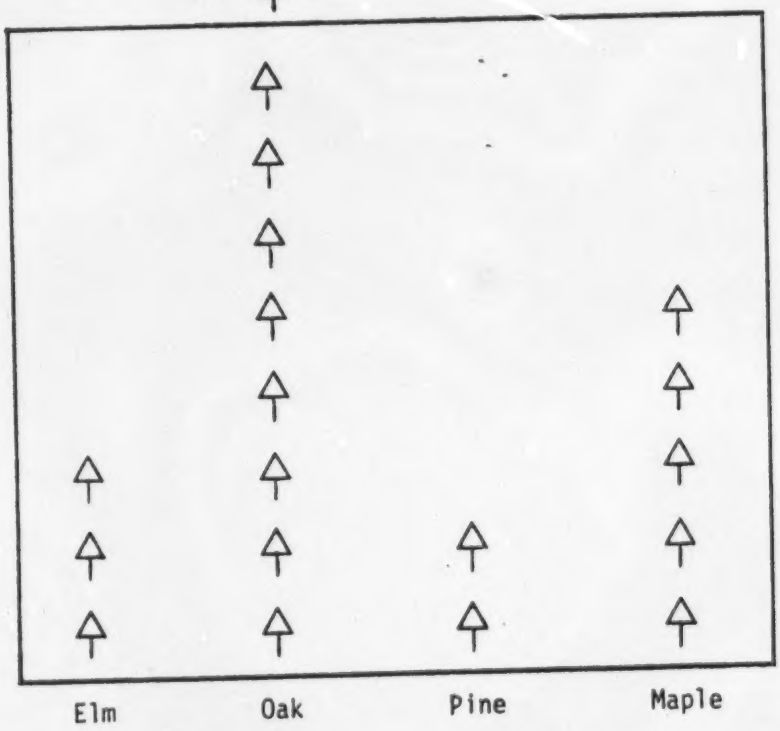
4. During which week did Cathy earn $4.00 less than Billy?

   a. 3rd b. 2nd c. 4th d. 1st

The graph below shows the kinds of trees that are found in a city park. In the graph, each ▲ stands for 10 trees. Use the graph to answer questions 5-7.

Number of Trees of Each Kind in a City Park

Each ▲ stands for 10 trees



5. How many maple trees are in the park?

a. 5 b. 25 c. 50 d. 10

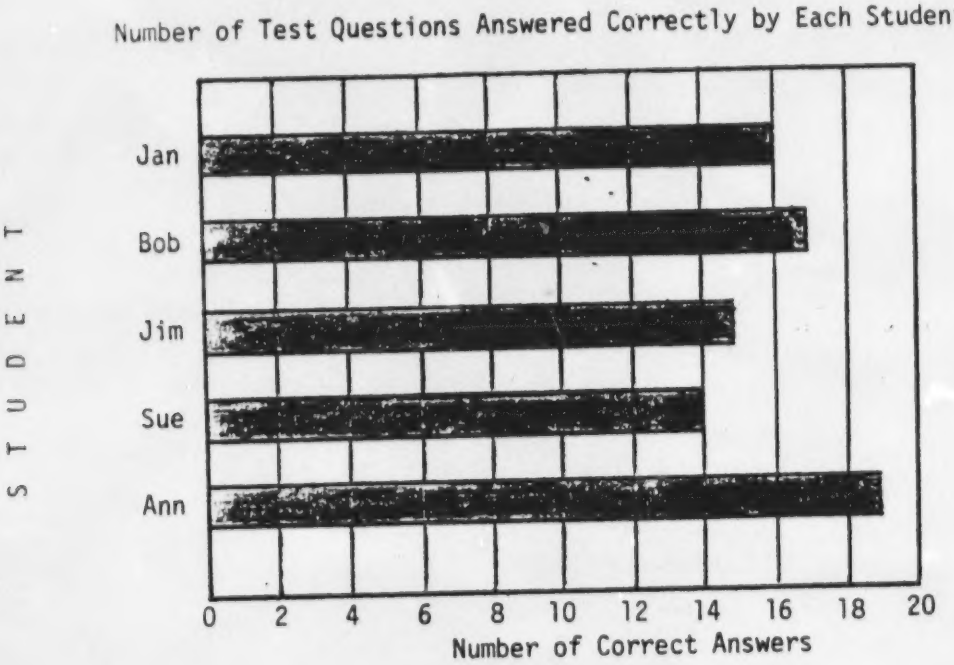
6. Find the kind of tree that has the smallest number of trees in the park. How many trees of this kind are in the park?

a. 20 b. 40 c. 2 d. 10

7. How many more oak trees are in the park than pine trees?

a. 6 b. 30 c. 50 d. 60

The graph below shows the number of questions on a test that were answered correctly by five students. Use the graph to answer questions 8-10.



8. How many questions did Sue answer correctly?

a. 14 b. 15 c. 17 d. 18

9. Which student answered 15 questions correctly?

a. Ann b. Bob c. Jim d. Jan

10. How many more questions were answered correctly by Ann than Jan?

a. 2 b. 3 c. 4 d. 5

CRITERION TEST 3.3

GEOMETRY AND MEASUREMENT

Directions: Read each question carefully. Choose the best answer and mark the appropriate choice on your answer sheet.

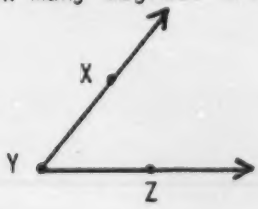
1. Which figure looks most like a rectangle?

a. b. c. d.

2. Which figure looks most like a cube?

a. b. c. d.

3. About how many degrees are in angle XYZ?



a. 15° b. 45° c. 90° d. 135°

4. Which triangle is congruent to triangle XYZ?

a. b. c. d.

5. You begin a trip at 10:00 a.m. and reach your destination at 1:30 p.m. How many hours did the trip take?

   a. 3½ hours b. 11½ hours c. 1½ hours d. 8½ hours

6. Assume that today is the 12th day of the month. What would the date be one week from today?

   a. 13th b. 18th c. 19th d. 22nd

7. Assume that today is the 13th day of the month. What would the date be two weeks from today?

   a. 15th b. 20th c. 26th d. 27th

8. August has 31 days. How many days is it from August 25th to September 20th?

   a. 27 days b. 26 days c. 45 days d. 5 days

9. How many inches long would you estimate this page to be from top to bottom?

   a. 11 inches b. 8 inches c. 14 inches d. 21 inches

10. Which number sentence would you use to find the number of inches in 4 feet?

    a. 12 ÷ 4 = ☐

    b. 4 x 3 = ☐

    c. 12 x 4 = ☐

    d. 12 + 6 = ☐

11. Which number sentence would you use to find the number of yards in 9 feet?

    a. 9 x 3 = ☐

    b. 9 ÷ 12 = ☐

    c. 12 x 3 = ☐

    d. 9 ÷ 3 = ☐

12. If a can of peaches weighs 14 ounces, how much do two cans weigh?

    a. 1 lb 12 oz

    b. 2 lb

    c. 2 lb 4 oz

    d. 2 lb 8 oz

13. Which of the units below would probably be used to measure your height?

    a. Decimeter

    b. Centimeter

    c. Meter

    d. Kilometer

14. Which of the units below would probably be used to measure milk that you would buy at the grocery?

    a. Gram

    b. Centigram

    c. Kiloliter

    d. Liter

15. How many centimeters equal one meter?

    a. 0.1

    b. 10

    c. 100

    d. 1000

APPENDIX C

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST ANSWER KEYS

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 1.1
Answer Key

1. c
2. d
3. b
4. d
5. a
6. b
7. d
8. c
9. a
10. b
11. d
12. a
13. c
14. b
15. d

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 1.2
Answer Key

1. b
2. d
3. c
4. a
5. b
6. d
7. c
8. a
9. b
10. d

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 1.3
Answer Key

1. d
2. c
3. a
4. c
5. b
6. d
7. b
8. a
9. c
10. a

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.1
Answer Key

1. a
2. c
3. d
4. a
5. b
6. c
7. c
8. b
9. a
10. d

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.2
Answer Key

1. c
2. b
3. a
4. d
5. c
6. b
7. a
8. c
9. d
10. b

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.3
Answer Key

1. b
2. c
3. d
4. d
5. a
6. b
7. a
8. d
9. d
10. b
11. c
12. a
13. c
14. d
15. a

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.4
Answer Key

1. d
2. b
3. c
4. a
5. b
6. c
7. a
8. c
9. b
10. d
11. b
12. a
13. c
14. d
15. a

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.5
Answer Key

1. d
2. b
3. c
4. d
5. a
6. c
7. b
8. c
9. a
10. b

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.6
Answer Key

1. a
2. d
3. b
4. c
5. d
6. c
7. a
8. b
9. a
10. d

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 2.7
Answer Key

1. b
2. a
3. d
4. b
5. c
6. d
7. a
8. d
9. c
10. a

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 3.1
Answer Key

1. c
2. b
3. d
4. b
5. a
6. d
7. a
8. b
9. d
10. c
11. a
12. d
13. b
14. c
15. a

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 3.2
Answer Key

1. d
2. b
3. a
4. b
5. c
6. a
7. d
8. a
9. d
10. b

MATHEMATICAL SKILLS CURRICULUM
CRITERION TEST 3.3
Answer Key

1. b
2. c
3. b
4. d
5. a
6. c
7. d
8. b
9. a
10. c
11. d
12. a
13. b
14. d
15. c

Supplement to Technical Report 135

DISTRIBUTION LIST

CNET (02, 022, N-55 (5 copies))
CNTECHTRA (016 (5 copies))
CO RTC (ART Division) GLAKES (2 copies)
CO RTC (ART Division) SDIEGO (2 copies)
CO RTC (ART Division) ORLANDO (3 copies)
DLIELC (Mr. Devine, Mr. Smilgin)
TDI (Dr. Spangenberg)
DTIC (12 copies)
DLSIE
Executive Editor, Psychological Abstracts, American Psychological Association
ERIC Processing and Reference Facility, Bethesda, MD (2 copies)
Director, English Technical Language School, Camp Santiago